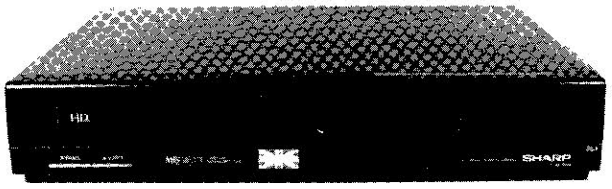
SHARP SERVICE MANUAL

S98i6VC-A105H



VHS VIDEO CASSETTE RECORDER

MODEL VC-A105HM

In the interests of user-safety (Required by safety regulations in some countries) the set should be restored to its original condition and only parts identical to those specified should be used.

CONTENTS

	page
• SPECIFICATIONS	2
• DISASSEMBLY AND REASSEMBLY	3
• LOCATION OF MECHANICAL PARTS	4
• ADJUSTMENT, REPLACEMENT, ASSEMBLING AND TOOLS NECESSARY FOR MECHANICAL ADJUSTMENT	6
• ADJUSTMENT OF ELECTRICAL CIRCUITRY	26
• TROUBLESHOOTING GUIDE	33
• SCHEMATIC DIAGRAMS	37
• WAVE FORMS	38
• OVERALL SCHEMATIC DIAGRAM	39
• WIRING SIDE PWBs	55
• REPLACEMENT PARTS LIST	59
• EXPLODE VIEWS	67
• PACKING OF THE SET	71

SHARP CORPORATION

SPECIFICATIONS

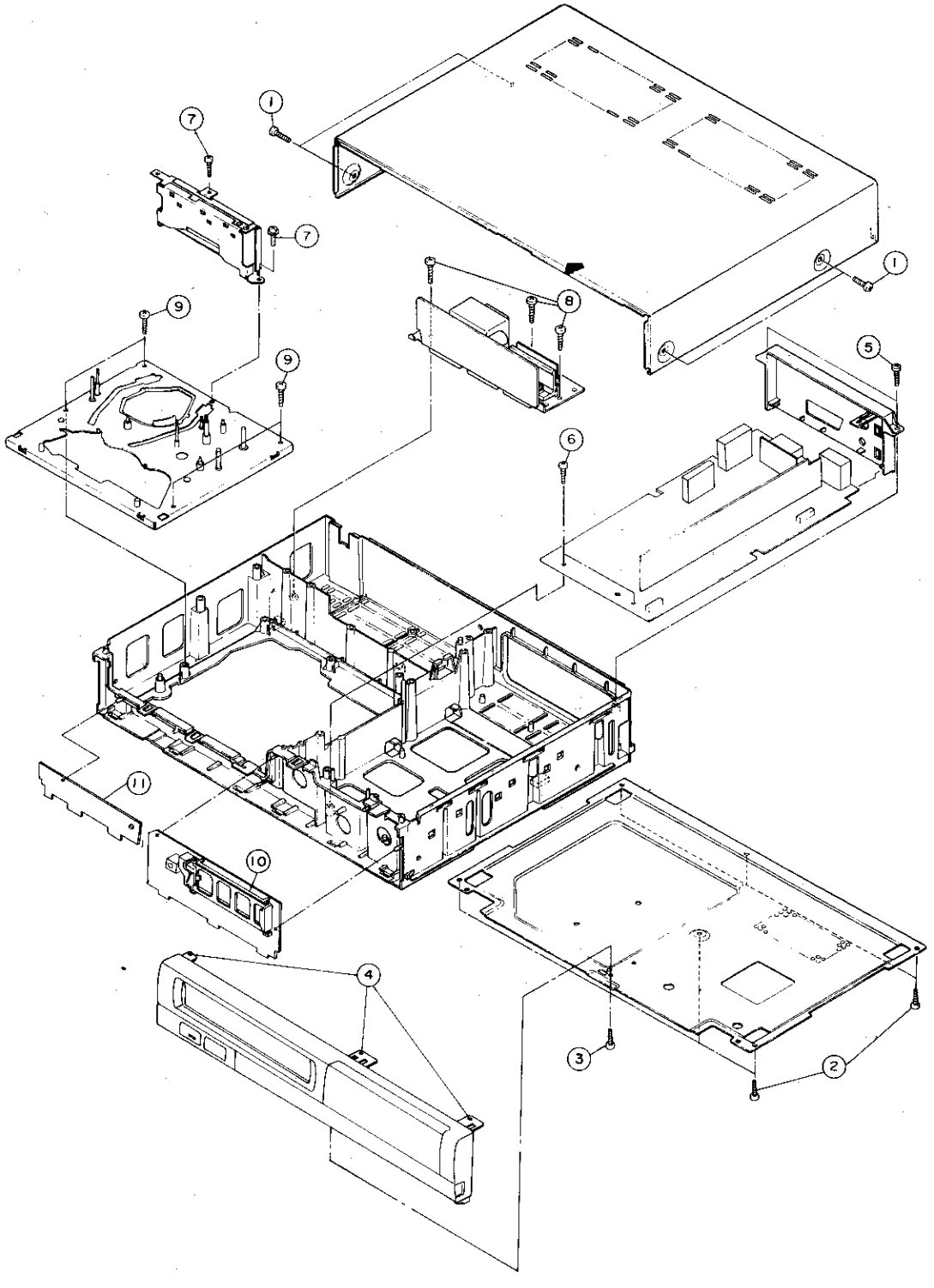
Format:	VHS PAL standard
Video recording system:	Two rotary head helical scan system
Video signal:	PAL colour and B/W signals, 625 lines
Recording playing time:	4 hours max. with SHARP E - 240 tape
Tape width:	12.7 mm
Tape speed:	23.39 mm/sec.
Antenna:	75 ohm unbalanced
Receiving channel:	UHF Channel 21 - 69
RF converter output signal:	UHF Channel 30 - 39 (Adjustable). Preset to 36 Channel
Power requirement:	AC 240V, 50 Hz
Power consumption:	Approx. 24W
Operating temperture:	5°C to 40°C
Storage temperature:	- 20°C to 55°C
Weight:	6.0 kg
Dimensions:	430 mm (W) x 348 mm (D) x 82 mm (H)
VIDEO	
Input:	1.0 Vp-p, 75 ohm
Output:	1.0 Vp-p, 75 ohm
AUDIO	0 dB = 0.775 Vrms
Input:	Line: - 3.8 dB, more than 50k ohm
Output:	Line: - 3.8 dB, less than 1k ohm
Accessories included:	Antenna 75 ohm coaxial connector cable (plug provided) Operation Manual Infrared remote control

As part of our policy of continuous improvement, we reserve the right to alter design and specifications without notice.

Note: The antenna must correspond to the new standard DIN 45325 (IEC 169 - 2) for combined UHF/VHF antenna with 75 ohm connector.

DISASSEMBLY AND REASSEMBLY

1. Remove the four upper cabinet fastening screws ①.
2. Remove the six bottom panel fastening screws ②.
3. Remove the one front panel fastening screw ③.
4. Release the three clips ④ and remove the front panel.
5. Remove the two antenna terminal cover fastening screws ⑤.
6. Remove the two main PWB fastening screws ⑥.
7. Remove the two head amp PWB fastening screws ⑦.
8. Remove the three power unit fastening screws ⑧.
9. Remove the four machanism chassis fastening screws ⑨.
10. Release the timer PWB ⑩ fastening clips.
11. Release the operation PWB ⑪ fastening clips.

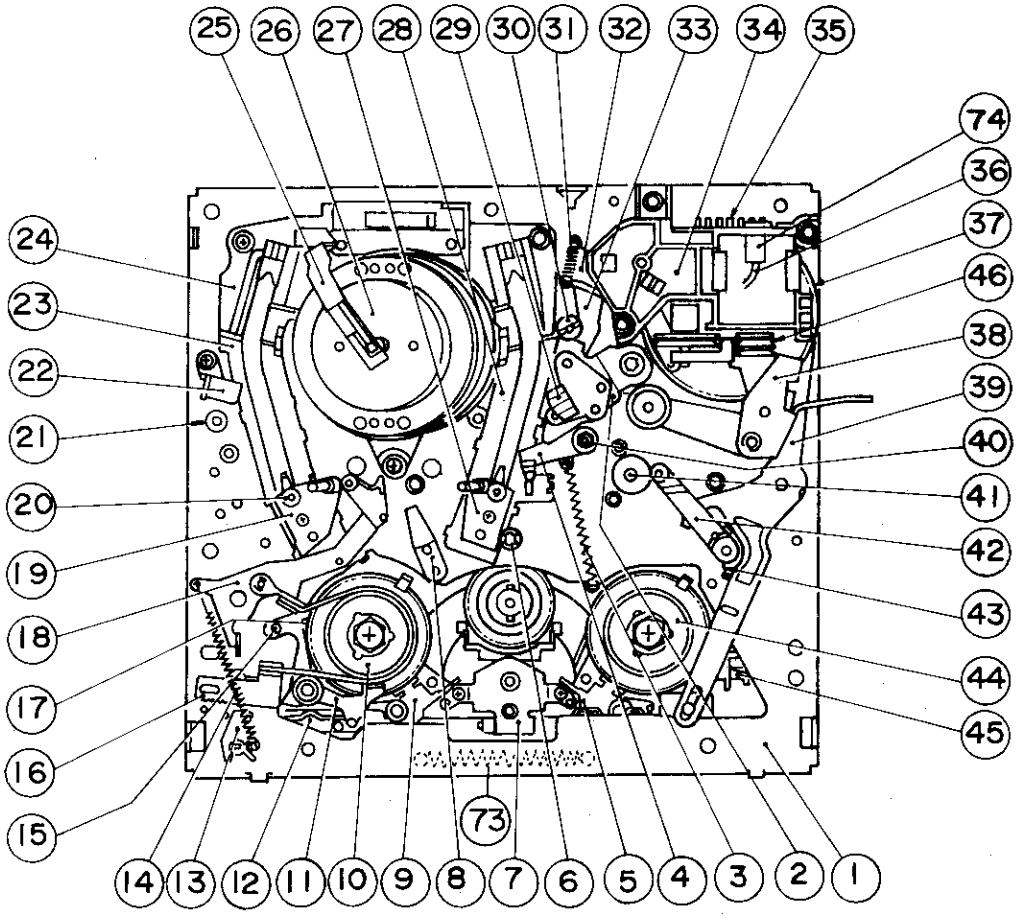


LOCATION LIST OF MECHANICAL PARTS

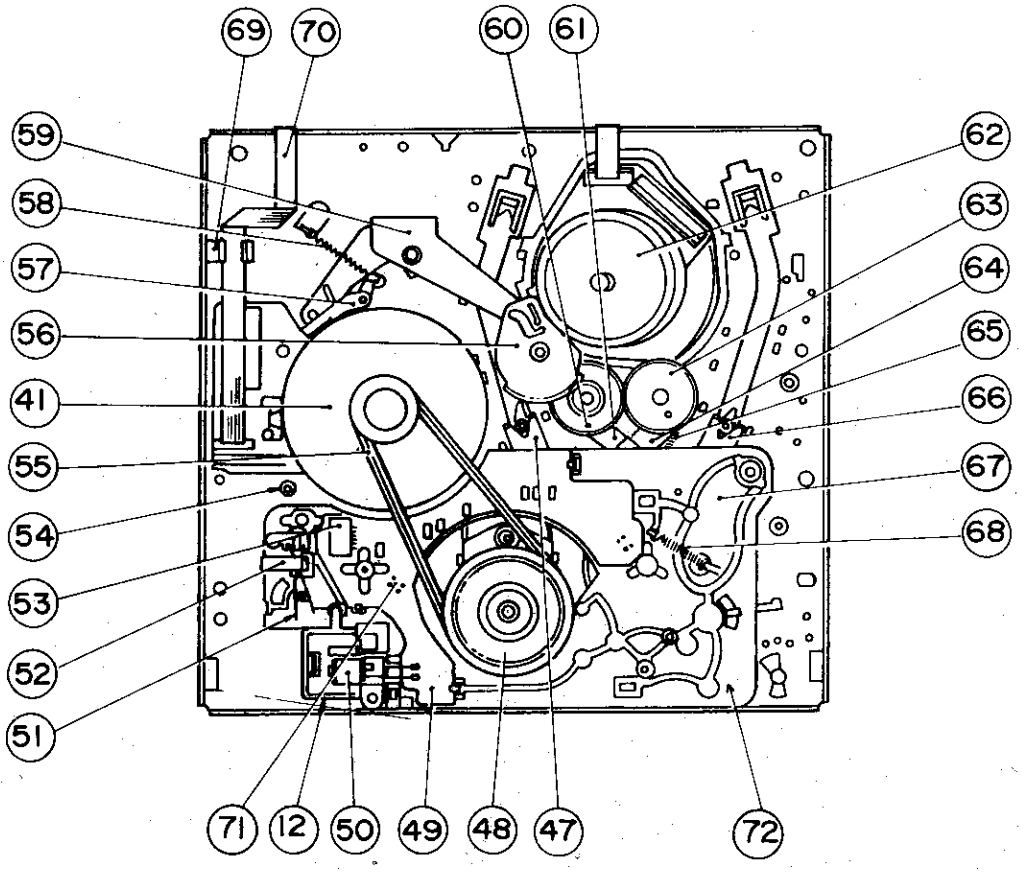
No.	Part Name	No.	Part Name
1	Main chassis ass'y	38	Pinch roller lever ass'y
2	A/C head arm	39	Relay shifter lever
3	Half-loading lever spring	40	Retaining guide
4	Half-loading lever	41	Capstan D.D.motor
5	Main take-up brake lever	42	Reverse guide
6	Cassette LED	43	Reverse guide spring
7	Idler gear ass'y	44	Take-up reel disk
8	Cassette control earth spring	45	Video search brake lever
9	Main supply brake lever	46	Loading belt
10	Supply reel disk	47	Take-up pole base slider
11	Back tension lever	48	Reel pulley
12	Brake shifter	49	Reel sensor PWB
13	Tension spring hook plate	50	Brake solenoid
14	Tension spring	51	Shifter spring
15	Tension release lever	52	Shifter spring cover
16	Tension band ass'y	53	Connector
17	Auxiliary fast forward brake lever	54	Reverse guide spring
18	Tension arm ass'y	55	Reel belt
19	Supply pole base ass'y	56	Loading relay gear
20	Guide roller ass'y	57	Slow brake lever
21	Supply impedance roller	58	Slow brake spring
22	Full erase head ass'y	59	Relay gear drive lever
23	Supply loading rail	60	Take-up loading gear
24	Drum base	61	Take-up loading arm ass'y
25	Earth brush ass'y	62	Drum D.D. motor ass'y
26	Drum ass'y	63	Supply loading gear
27	Take-up pole base ass'y	64	Supply loading arm ass'y
28	Take-up loading rail	65	Loading reciprocating spring
29	A/C head ass'y	66	Supply pole base slider
30	X-position adjusting nut	67	Reel block chassis
31	Half-loading reciprocating spring	68	Auxiliary fast forward brake spring
32	Half-loading reciprocating lever	69	Full flat cable holder
33	Half-loading drive lever	70	Full flat cable(Drum D.D. motor)
34	Loading block ass'y	71	Reel sensor
35	Cam switch	72	Reel block
36	Loading motor	73	Main brake spring
37	Master cam	74	Dew sensor

LOCATION OF MECHANICAL PARTS

- TOP VIEW



- BOTTOM VIEW



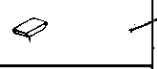
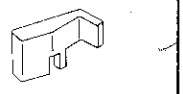
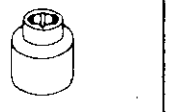
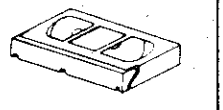
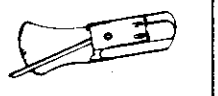
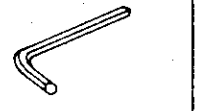
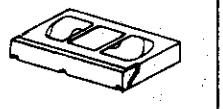
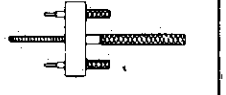
ADJUSTMENT, REPLACEMENT, ASSEMBLY AND CLEANING OF MECHANICAL UNITS

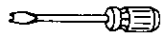
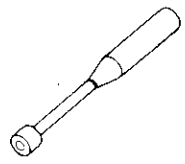
Here we will describe a relatively simple service work in the field, not referring to the more complicated repairs which would require the use of special equipment and tools (drum assembly or replacement, for example).

We are sure that the easy-to-handle tools listed below would be more than handy for periodical maintenance to keep the machine in its original efficient condition.

TOOLS NECESSARY FOR ADJUSTING THE MECHANICAL UNITS

The following tools are required for proper service and satisfactory repair.

No.	Jig Item	Part No.	Code	Configuration	Remarks
1	Reel Disk Height Adjusting Jig	JiGRH0002	BR		These Jigs are used for checking and adjusting the reel disk height.
2	Master Plane Jig	JiGMP0001	BY		
3	A/C Head Tilt Adjusting Jig	JiGACH-F18	BU		This Jig is used for settimg the A/C head tilt.
4	Torque Gauge (90g)	JiGTG0090	CM		These Jigs are used for checking and adjusting the torque of take-up and supply reel disks.
	Torque Gauge (1.2 kg)	JiGTG1200	CN		
5	Gauge Head	JiGTH0006	AW		
6	Cassette Torque Meter	JiGVHT-063	CZ		This cassette torque meter is used for checking and adjusting the torque of take-up and supply reel and for measuring tape back tension.
7	Tension Gauge (300g)	JiGSG0300	BF		There are two Gauges used for the tension measurements, 300 g and 2.0 kg.
	Tension Gauge (2.0 kg)	JiGSG2000	BS		
8	Hex Wrench (0.9 mm)	JiGHW0009	AE		These Jigs are used for loosening or tightening special Hexagon type screws.
	Hex Wrench (1.2 mm)	JiGHW0012	AE		
	Hex Wrench (1.5 mm)	JiGHW0015	AE		
9	Alignment Tape (PAL)	VROCPSV	CK		This tape is especially used for electrical fine adjustment.
10	Drum Replacing Jig	JiGDT-0001	BG		This is used for replacement of the VCR's upper drum.
11	Tension Gauge Adapter	JiGADP003	BK		This Jig is used for the tension gauge. Rotary Transformer Clearance Adjusting Jig.

No.	Jig Item	Part No.	Code	Configuration	Remarks
12	Special Bladed Screwdriver	JiGDRiVERH-4	AP		This Screwdriver is used for adjusting the guide roller height and X-position.
13	Tension Band and Plate Adjusting Jig	JiGDRiVER-6	BM		This Jig is used for adjusting the tension band and tension plate.
14	Torque Driver	JiGTD1200	CB		This is used to screw down resin-made parts: the specified torque is 5 kg.
15	Box Driver	JiGDRiVER110-7	AS		This Jig is used for height adjustment of the A/C head.
		JiGDRiVER110-4	AV		This Jig is used for height adjustment of the retaining guide.
16	Retaining Guide Height Adjusting Jig	JiGGH-F18	BU		This Jig is used for height adjustment of the retaining guide.
17	Reverse Guide Height Adjusting Jig	JiGRVGH-F18	BU		This Jig is used for height adjustment of the reverse guide.

NOTE:
Current JiGMA0001 contains Master Plane (JiGMP0001) and Disk Height Adjusting Jig (JiGRH0001). Even though new Disk Height Adjusting Jig (JiGRH0002) covers greater height, this new Jig (JiGRH0002) can be used for current JiGRH0001, but current Jig (JiGRH0001) cannot be used as JiGHR0002.Master Plane (JiGMP0001)can be used with JiGRH0001 and JiGRH0002 as well.

JIGACH513

SHARP ELECTRONICS (UK) LTD.
The Crossley Centre

MECHANICAL PARTS REQUIRING PERIODICAL INSPECTION

Use the following table as a guide to maintain the mechanical parts in good operating condition.

Parts \ Maintained every	500 hrs.	1000 hrs.	1500 hrs.	2000 hrs.	3000 hrs.	Remarks
Guide roller ass'y	□	□	□	□	□	Abnormal rotation or significant vibration requires replacement.
Supply impedance roller	□	□	□	□	□	
Supply impedance roller (inner)		□		□	□	Clean with pure high quality isopropyl alcohol.
Supply impedance roller flange	□	□	□	□	□	Clean tape contact area with the specified cleaning liquid.
Retaining guide	□	□	□	□	□	
Slant pole	□	□	□	□	□	
Video head	□	○□	□	○□	○□	
Full-erase head	□	□	□	□	□	
A/C head	□	□	□	□	□	
Pinch roller	□	□	□	□	○□	Clean rubber and rubber contact area with the specified cleaning liquid.
Reel belt		□		□		
Loading belt		□		○		
Capstan loading belt		□		○		
Reel block*				○		
Tension band ass'y					○	
*See the table below for servicing the reel block parts.						
Supply/take-up reel disks		□ △		□△○		Clean with pure high quality isopropyl alcohol.
Video serch brake lever				○		
Idler gear ass'y				○		
Reel idler		□△		□△		
Main supply/take-up brake levers				○		

NOTE: ○: Part replacement.
□: Cleaning (For cleaning, use a lint-free cloth dampened with pure isopropyl alcohol).
△: Oil refilling (The indicated point should be lubricated with high quality spindle oil every 1000 hrs).

This model has no adjusting parts for torques, tension, etc. If the reading is outside the specified range, clean or replace the part.

REMOVAL AND REASSEMBLY OF CASSETTE HOUSING CONTROL ASSEMBLY

Notes:

1. During removal and reassembly, be careful not to strike the nearby guide pin, drum, etc.
2. Before removal or reassembly, be sure to unplug the recorder from the AC outlet.
3. When removing and attaching the cassette loading belt, be careful to keep it free from grease.

- **Removal**

1. Put the unit in the cassette eject position.
2. Remove the cassette loading belt ① .
3. Disconnect the FFC (Full Flat Cable) ② at the right side of the cassette housing control assembly.
   Note: Be careful not to break the FFC.
4. Remove the two cassette housing installation screws.
5. Move the cassette housing control assembly (Fig. 1-1) in the direction of arrow ⇒ Ⓑ, and pull it out straight upward.

- **Reassembly**

1. Insert the tabs of the cassette housing control assembly into the mechanism chassis, move it in the direction of arrow ⇒ Ⓐ, and secure temporarily.
   Check to see if the cassette housing control assembly is in the correct position, and then tighten the two screws (XHPS330P06WS0) .
2. Attach the cassette loading belt ①.
3. Connect the FFC ② at the right side of the cassette housing control assembly.

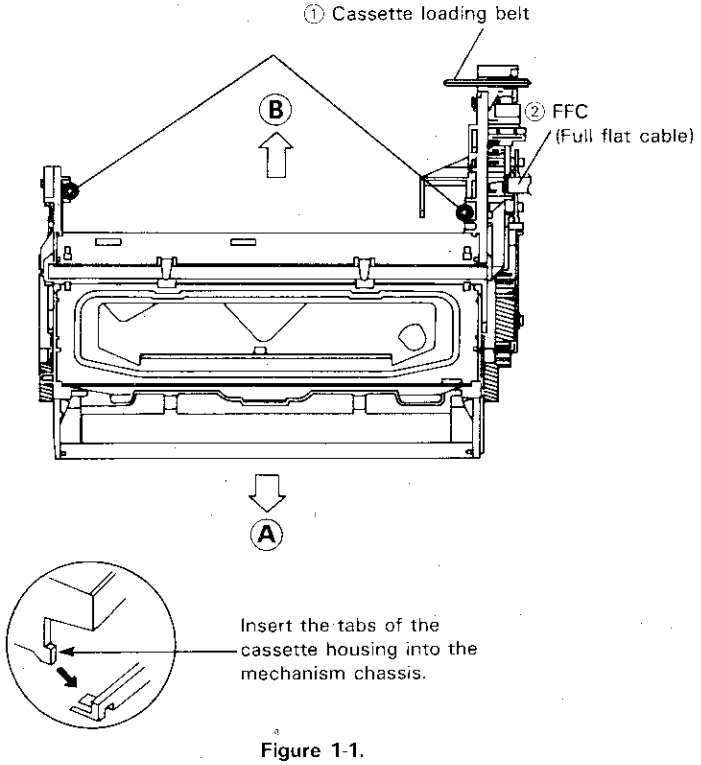


Figure 1-1.

REPLACEMENT OF WORM WHEEL ASSEMBLY

- **Removal (Fig. 1 - 2)**

1. Unsolder the cassette switch connector from the start sensor PWB ①
2. Release the two catches Ⓐon the cassette housing frame (R), and remove the PWB.
3. Unscrew one B tight screw ② to detach the worm bracket ③.
   Note: The bearing ④ can come off position too. So be careful not to let the bearing fall.
4. Remove the worm shaft assembly ⑤, pulley ⑥ and cassette loading belt ⑦ all from the cassette housing frame (R).
5. Finally pull the worm wheel assembly out of the boss of the cassette housing frame (R).

- **Reassembly (Fig. 1-2)**

1. Turn the phase gear ⑧ clockwise until the slider comes to a halt in the cassette insertion direction.
2. Set up the worm wheel gear assembly onto the boss on the cassette housing frame (R), matching the mark Ⓖ on the phase gear ⑧ with the mark Ⓗ on the worm wheel gear.
   Note: Make sure that the slider pin is in the groove of the drive gear arm.
3. Install the pulley ⑥ and apply the cassette loading belt ⑦ both on the worm shaft assembly ⑤. Couple the clutch ⑩ to the clutch lever ⑨. And mount them together in the cassette housing frame (R) .
4. Attach the worm bracket ③ to the worm shaft assembly ⑤. Place them onto the boss on the cassette housing frame (R).
5. Tighten one B tight screw ②.
   Note: Make sure that the parts Ⓒ and Ⓓ of the cassette housing frame (R) are properly engaged with the parts Ⓔ and Ⓕ of the worm bracket ③.
6. Hook the start sensor PWB① on the two positions Ⓐ on the cassette housing frame (R).
   Note: Check that the switch connector is right in the cassette switch mounting hole Ⓑ.
7. Finally resolder the cassette switch connector to the start sensor PWB.

Notes:

1. Do not overtighten the B tight screw (no more than 5.0 ± 0.5 kg. cm), because otherwise the lower threads of the screw hole at the resin-made boss may be broken.
2. Keep in mind that the clutch switching lever should be in the correct positional relation. The mechanism might malfunction even if the lever comes slightly out of position.

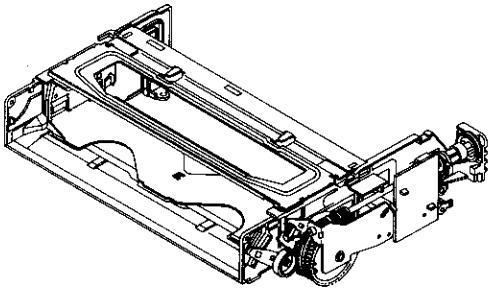


Figure 1-2 (a).

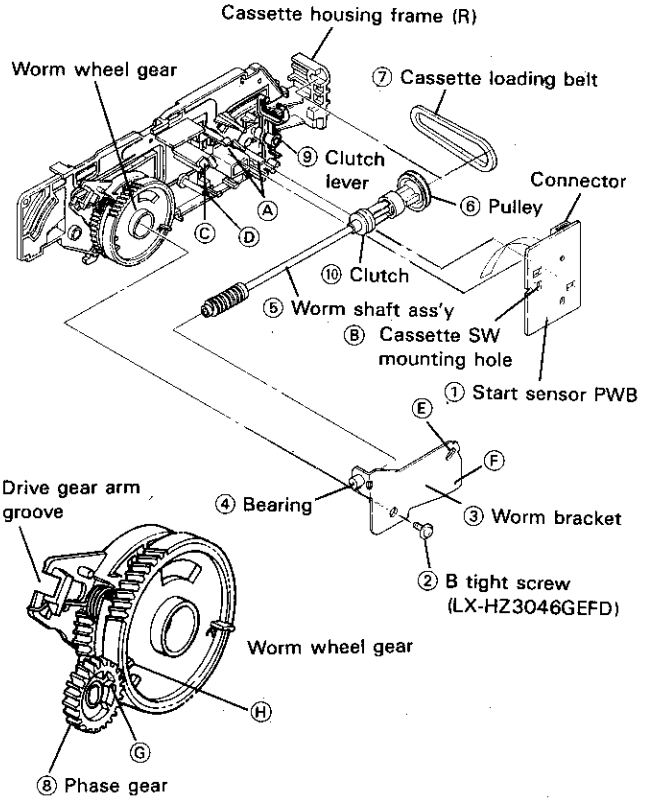


Figure 1-2 (b).

- **Reassembly of drive gear (Fig.1- 3)**

1. Pass the tip Ⓑ of the drive gear spring (R) ② through the square hole Ⓐ of the drive gear (R) ① to the hook the spring in position.
2. Hook one end Ⓓ of the reciprocating spring ③ to the catch Ⓒ of the drive gear (R) ①.
3. Hook the other end Ⓔ of the reciprocating spring ③ to the catch Ⓕ of the worm wheel ④.
4. Fit the drive gear (R) ① to the worm wheel ④ so that the catch Ⓖ and boss Ⓙ on the drive gear (R) are exactly in the square hole Ⓗ and round hole Ⓘ, Respectively, in the worm wheel.

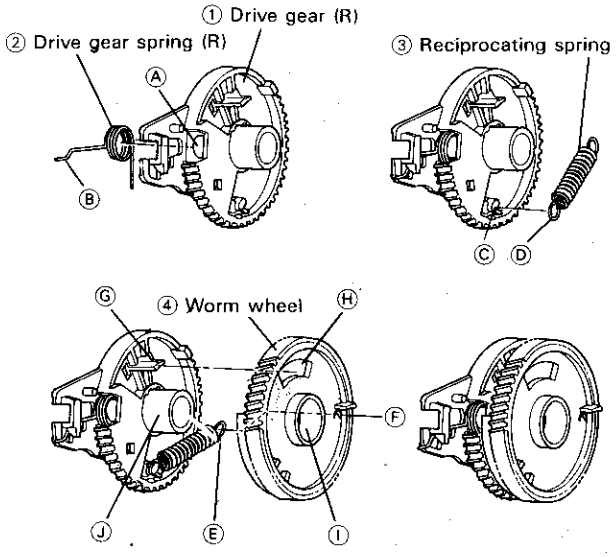


Figure 1-3.

REPLACEMENT OF CASSETTE LOADING BELT

- **Replacement (Fig. 1-4)**

1. Remove the start sensor PWB and worm bracket from the cassette housing frame (R).
2. Remove the worm shaft assembly, pulley and cassette loading belt from the cassette housing frame (R).
3. Replace the cassette loading belt with a new one.

Notes:

1. Do not overtighten the B tight screw which holds the worm bracket in position. The specified tightening torque is 5.0 ± 0.5kg. cm.
2. Make sure that the cassette loading belt, being applied in the cassette housing frame (R), is free from grease. If stained with grease, clean the belt with the specific cleaning liquid.
3. Finally check the clutch switching lever for its specified points.

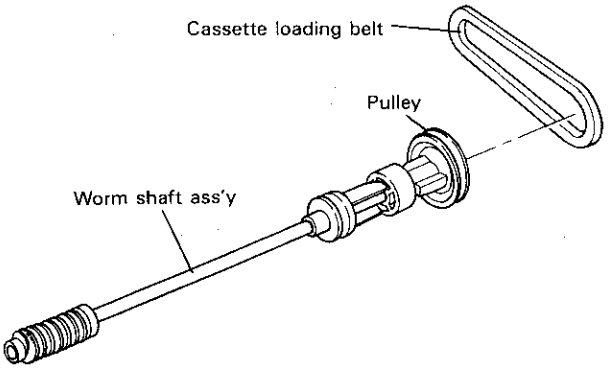


Figure 1-4.

CHECKING THE CLUTCH SWITCHING LEVER

- **Checking (Fig. 1-5)**

When removing and attaching the clutch switching lever from and to the mechanism chassis, check to see if the lever is in the position as shown below. If out of this position, malfunction might result.

1. First make sure that the rib Ⓐ of the drive gear (R) ① and the tip Ⓑ of the switch lever ② are in their correct positions.
2. Check also that the rib Ⓒ of the cassette housing frame (R) and the catch Ⓓ of the clutch lock lever ③ are in their proper positions.
3. Finally be sure that the positional relations between the clutch lever ④ and the clutch ⑤, as well as between the clutch ⑤ and the pulley ⑥, are as specified.

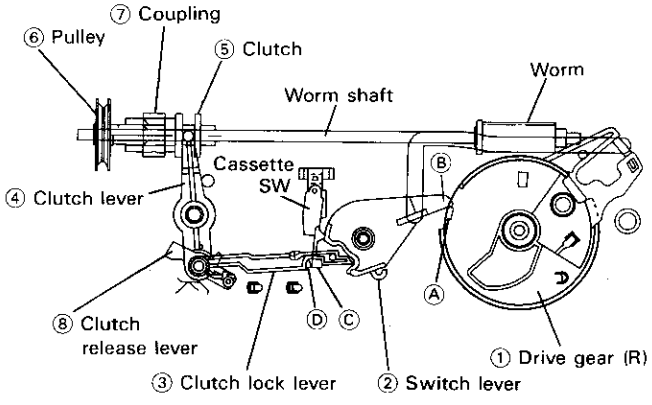


Figure 1-5.

- **Resetting (Fig. 1-6)**

Take the following steps to reset the clutch ⑤ if it is unlocked or if the switch lever ② and clutch lock lever ③ are unlocked.

1. Turn the coupling ⑦ clokwise (as viewed from the front of the set) until the slider comes to the position indicated below.
   Note: Notice that the slider is equipped with a lock mechanism. Unlock the slider, therefore, before shifting the slider.

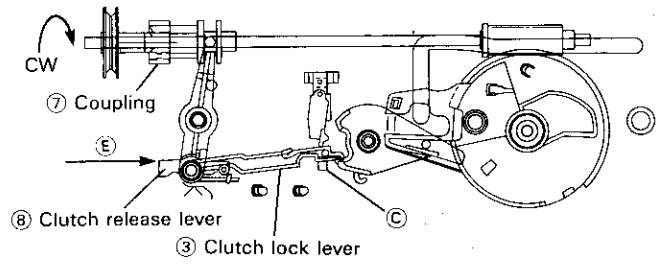


Figure 1-6.

2. Now push the clutch release lever ⑧ in the direction of arrow Ⓔ by hand until the clutch lock lever ③ becomes tightly locked by the part Ⓒ of the cassette housing frame (R).
3. Then turn the coupling ⑦ counterclockwise until the slider reaches the cassette insertion opening and the reciprocating spring is activated.
   Note: There is no need to lock the slider. Just keep shifting the slider.

REPLACEMENT OF LOCK RELEASE LEVER

- **Removal (Fig. 1-7)**

1. Turn the coupling clockwise until the slider ① comes to the cassette down position.
   Note: Before shifting, unlock the slider.
2. Slightly widen the cassette housing frames (R) and (L) to unhook the parts Ⓐ of the slider holders (R) and (L) off the grooves of the above frames.
3. Press the catch Ⓑ on the slider holder (R) ②, and let the slider ① go off this holder in the direction of arrow Ⓒ.
4. Take the lock release lever ③ out of the slider holder (R) ②.

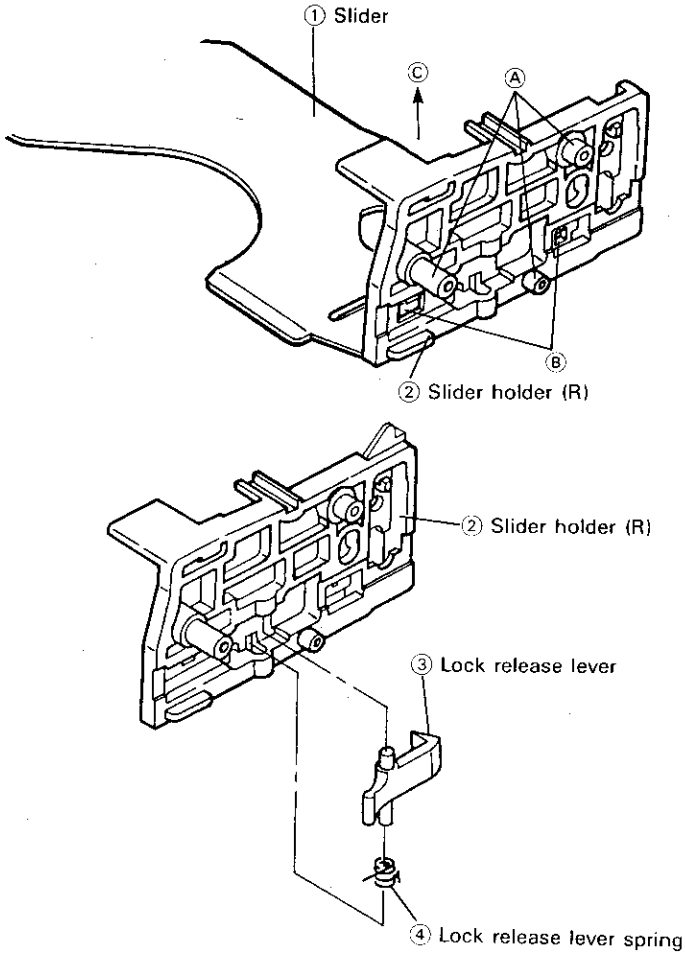


Figure 1-7.

- Reassemdly (Fig. 1-7)

1. Attach the lock release lever ③ to the slider holder (R) ②.
2. Fit the slider holder (R) ② to the slider ①.
3. Slightly widen the cassette housing frames (R) and (L), and set the parts Ⓐ of the slider holders (R) and (L) to the grooves of the cassette housing frames (R) and (L).
   Note: Make sure of the following fitting: Fitting between the parts Ⓐ of the slider holders (R) and (L) and the grooves of the cassette housing frames (R) and (L), as well as between the drive gear arms and the slider holders (R) and (L).
4. Turn the coupling counterclockwise until the slider ① comes to the cassette insertion opening.

TO RUN A TAPE WITHOUT THE CASSETTE HOUSING CONTROL ASSEMBLY

1. Open the lid of a cassette tape by hand and hold it with a piece of vinyl tape.
2. Set the cassette tape in the tape mechanism.Then, stabilize the cassette tape with a weight (500g or less).
   Note: The weight should not be more than 500g.

REMOVAL AND HEIGHT ADJUSTMENT OF REEL DISKS

- Removal of supply reel disk:

1. Remove the cassette housing control assembly.
2. Set the mechanism in the playback mode with no cassette tape in place. Unplug the power cord.
3. Remove the tension band ⑧.
4. Unscrew the screw ⑩ and release the cassette housing control ground spring ⑫ off the reel disk catch ①.
5. Release the supply reel disk catch ① and back tension lever ②. Pull out the supply reel disk ③ upward.

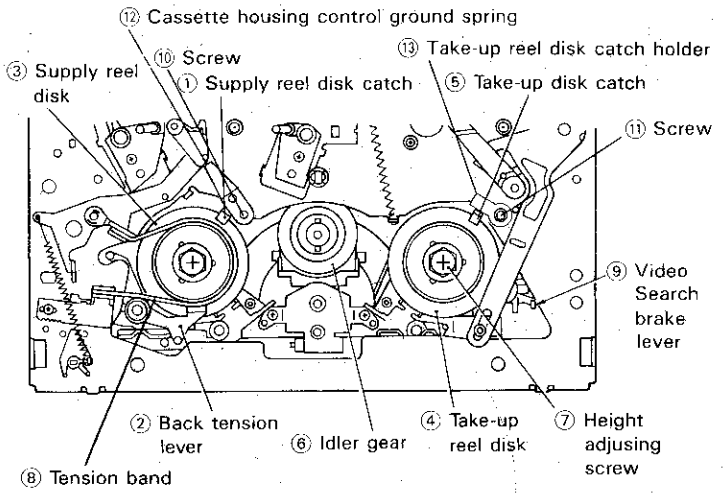

⑫ Cassette housing control ground spring
⑩ Screw
⑬ Take-up reel disk catch holder
③ Supply reel disk
① Supply reel disk catch
⑤ Take-up disk catch
⑪ Screw
⑨ Video Search brake lever
② Back tension lever
⑥ Idler gear
④ Take-up reel disk
⑦ Height adjusing screw
⑧ Tension band

Figure 1-8.

- Removal of take-up reel disk:

1. Remove the cassette housing control assembly.
2. Set the mechanism in the playback mode with no cassette tape in place. Unplug the power cord.
3. Unscrew the screw ⑪ and release the take-up reel disk catch holder ⑬ off the reel disk catch ⑤.
4. Release the take-up reel disk catch ⑤. Pull out the take-up reel disk ④ upward.

Notes:

1. After replacing either of the reel disks, be sure to perform the height adjustment procedure.
2. Take care not to deform the tension hand.
3. Be careful not to deform the back tension lever, main supply / take - up brake levers, video search brake lever and auxiliary fast forward brake. (See pages 4 and 5.)
4. Check the tension pole position. (See pages 15.)
5. Be careful not to damage the supply reel disk, take-up reel disk and idler gear ⑥.
6. Whenever replacing, clean and lubricate the reel disk shaft.

- Reassembly of supply reel disk:

1. Clean the reel disk shaft and apply oil (high quality spindle oil) to it, then install a new supply reel disk onto the shaft.
2. Replace the cassette housing control ground spring ⑫ in position and tighten up the screw ⑩.
3. Replace the tension band ⑧.
4. Adjust the reel disk height by using the master plane and reel disk height adjusting jig.

- Reassembly of take-up reel disk:

1. Clean the reel disk shaft and apply oil (high quality spindle oil) to it. Then, release the video search brake lever and install a new take - up reel disk onto the shaft.
2. Replace the take-up reel disk catch holder 13 in position and tighten up the screw ⑪.
3. Adjust the reel disk height by using the master plane and reel disk height adjusting jig.

Notes:

1. During removal and reassembly, be careful not to damage the reel disks, reel shafts, idler gear and brake levers.
2. After reassembly, check the back tension in video search rewind mode (see page 14) and checking the brake torque (see page 16)

HEIGHT ADJUSTMENT

1. Remove the cassette housing assembly, and place the master plane onto the mechanism unit as shown in Fig.1-9 (a), taking care not to hit the drum.
2. Ensure that the reel disk is lower than the part Ⓐ but higher than the part Ⓑ of Fig. 1-9 (b), by using the reel disk height adjusting jig. If the height is not correct, adjust the height adjusting screw.
   Note: Whenever replacing the reel disk, perform the height adjustment.

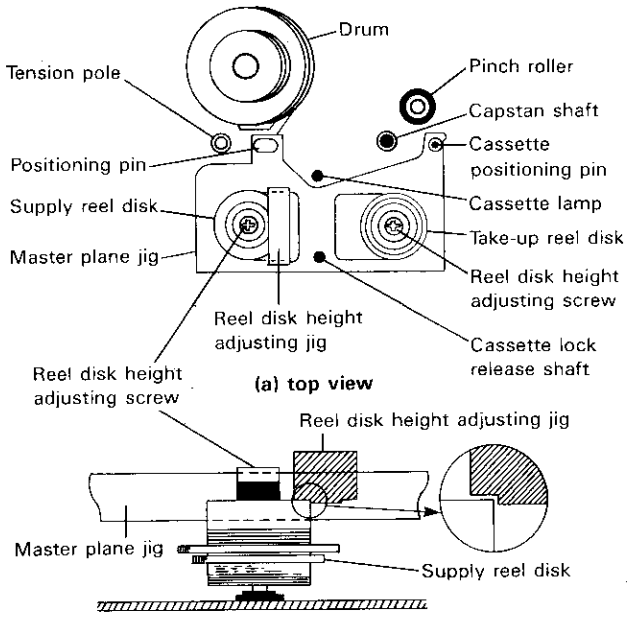


Figure 1-9.

CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN FAST-FORWARD MODE

Notes:

1. When setting the torque gauge on the take-up reel disk and pushing the fast-forward button to start the reel disk turning, take care that the torque gauge does not fly off.
2. The checking and adjustment should be carried out without a video cassette tape in place.

- **Checking**

1. Remove the cassette housing assembly.
2. Place the torque gauge on the take-up reel disk and push the fast-forward button to place the unit in the fast-forward mode.
3. Turn the torque gauge slowly (one rotaion every 2 to 3 seconds) by hand in the take-up direction and check that it indicates 700 g.cm or more.

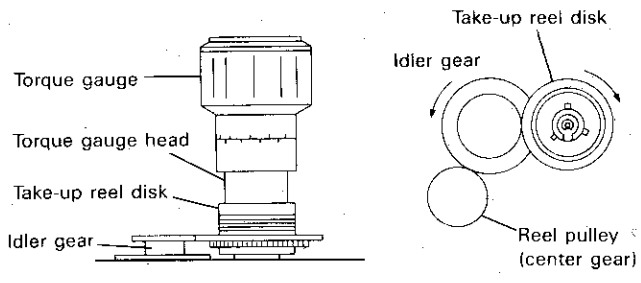


Figure 1-10.

- **Adjustment**

If the take-up torque is outside the specified range, clean the capstan D.D. motor pulley, reel belt and reel pulley with cleaning liquid, then recheck the torque.
If the take-up torque is still out of specification, replace the reel belt.

CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN REWIND MODE

Notes:

1. When setting the torque gauge on the supply reel disk and pushing the rewind button to start the reel disk turning, take care that the torque gauge does not fly off.
2. When checking the take-up torque, do not keep the reel disk locked for a longer time.

- **Checking**

1. Remove the cassette housing assembly.
2. Place the torque gauge on the supply reel disk and push the rewind button to place the unit in the rewind mode.
3. Turn the torque gauge slowly (one rotation every 2 to 3 seconds) by hand in the take-up direction and check that in indicates 700 g.cm or more.

- **Adjustment**

If the take-up torque is outside the specified range clean the capstan DD motor pulley, reel belt and reel pulley with cleaning liquid, then recheck the torque.
If the take-up torque is still out of specification, replace the reel belt.

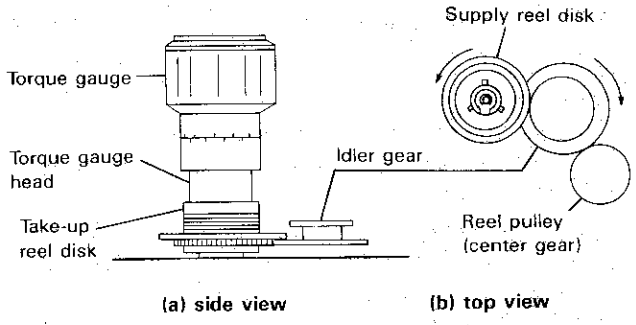


Figure 1-11.

CHECKING OF TAKE-UP TORQUE IN PLAY-BACK MODE

- **Checking**

Load a cassette torque meter (JiGVHT-063) into the unit and push the record button to place the unit in the record mode. Then check that the torque is as specified;

torque: 95 ± 30 g.cm

Note:
The measured torque fluctuates due to the rotational deviation of the reel drive unit. Use the center of the fluctuating range as the measured value.

1. If the take-up torque in playback mode is outside the specified value, replace the take-up reel disk.
2. Push the record button to place the unit in the record mode, and check that the take-up torque is within the specified range.

CHECKING OF TAKE-UP TORQUE IN VIDEO SEARCH REWIND MODE

- **Checking**
  Load a cassette torque meter (JiGVHT-063) into the unit and push the play and video search rewind buttons to place unit in the video search rewind mode.
  Then check that the torque is as specified;
  torque in video search rewind mode : 170 ± 40 g.cm

Note:
The measured torque fluctuates due to the rotational deviation of the supply reel disk. Use the center of the fluctuating range as the measured value.

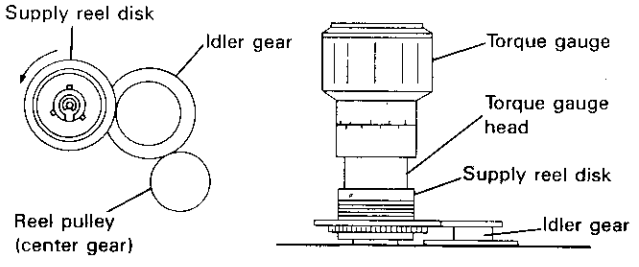
1. If the take-up torque in video search rewind mode is outside the specified range, replace the supply reel disk.

CHECKING THE FAST FORWARD BACK TENSION

Note:
Set the torque gauge securely on the supply reel disk; if the torque gauge is loose above the reel disk, an inaccurate measurement will result.

- **Checking**

1. Remove the cassette housing assembly.
2. Push the fast forward button to place the unit in the fast forward mode.
3. Place the torque gauge on the supply reel disk, and turn it clockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within 15 ± 5 g.cm.



(a) top view (b) side view

Figure 1-12.

CHECKING THE REWIND BACK TENSION

Note:
Set the torque gauge securely on the take-up reel disk; if the torque gauge is loose above the reel disk, an inaccurate measurement will result.

- **Checking**

1. Remove the cassette housing assembly.
2. Push the rewind button to place the unit in the rewind mode.
3. Place the torque gauge on the take-up reel disk, and turn it counterclockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within 15 ± 5 g.cm.

CHECKING THE VIDEO SEARCH REWIND BACK TENSION

Note:
Set the torque gauge securely on the take-up reel disk; if the torque gauge is loose above the reel disk, an inaccurate measurement will result.

- **Checking**

1. Remove the cassette housing assembly.
2. Push the play button to place the unit in the playback mode.
3. Push the video search rewind button to place the unit in the video search rewind mode.
4. Place the torque gauge on the take-up reel disk, and turn it counterclockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within 40 ± 10 g.cm.

CHECKING THE PINCH ROLLER PRESSURE

1. Remove the cassette housing assembly.
2. Push the play button to place the unit in the playback mode.
3. Hook the tension gauge adapter around the pinch roller shaft.
4. Using a tension gauge, pull the pinch roller in the direction of arrow ⇒ Ⓐ so that the pinch roller moves away from the capstan shaft.
5. Gradually release the pressure in the direction of arrow⇒ Ⓑ to allow the pinch roller to touch the capstan shaft. When the pinch roller just touches the capstan shaft, read the indication on the gauge.
6. Check that the reading of the tension gauge is in the range of 1000 to 1200 gr.

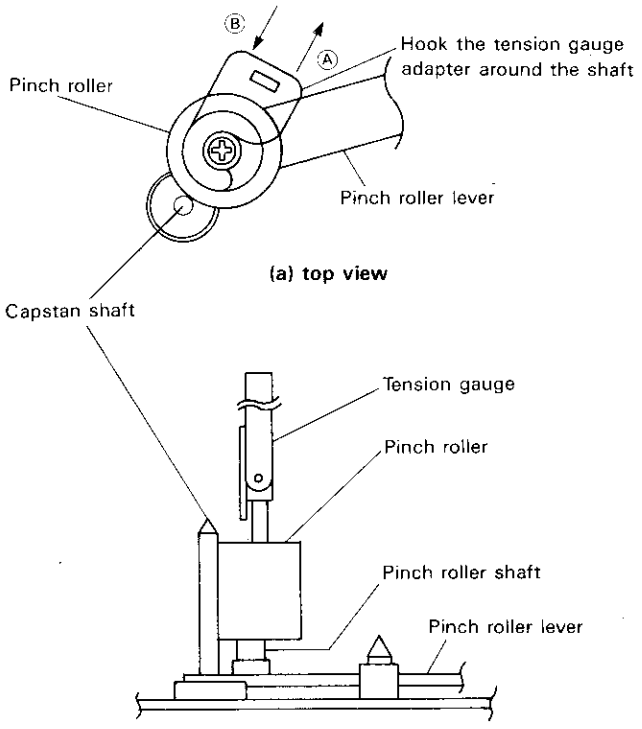


Figure 1-13.

ADJUSTMENT OF TENSION POLE

- **Position checking (Fig. 1-14)**

1. Remove the cassette housing assembly.
2. Set a video cassette tape and push the record button to place the unit in the record mode.
3. The pole bases (see page 4; item 19 and 27.) operate to bring the tape outside the cassette housing and simultaneously the tension pole moves to the left, loading the tape. At that time (loading mode), check the position of the tension pole.

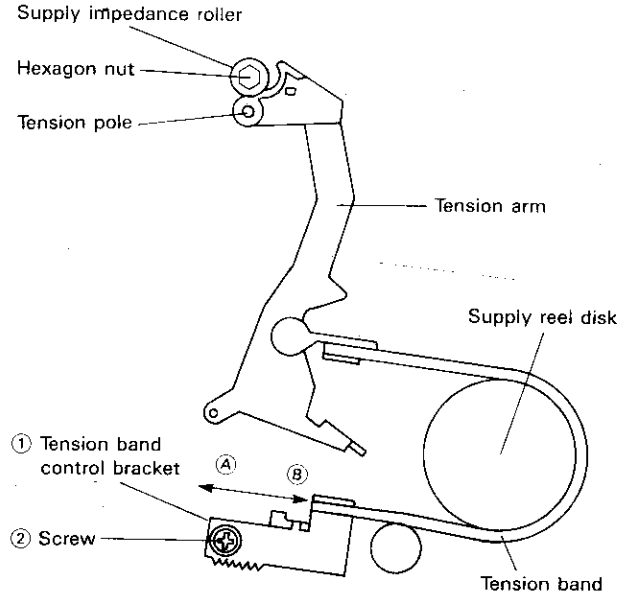


Figure 1-14.

4. At the end of the tape (E-180), check that the tension pole's center is aligned with the supply impedance roller's center.
5. Check that the tape is neither curled against the flange of the supply impedance roller nor mounted over it.
6. During the video search rewind mode with no cassette tape in place, check the supply reel disk is free of the tension band.

- **Position adjustment (Fig. 1-15)**

1. If the tension pole is at the right of the supply impedance roller's center, shift the tension band control bracket ① in the direction of arrow ⇒ Ⓑ , and tighten the screw ②.
2. If the tension pole is at the left of the supply impedance roller's center, shift the tension band control bracket ① in the direction of arrow ⇒ Ⓐ , and tighten the screw ② .

ADJUSTMENT OF RECORD/PLAYBACK BACK TENSION

- **Checking**

1. Remove the cassette housing assembly.
2. Put a torque cassette meter into the unit.
3. Push the record button to place the unit in the record mode. Check that the reading of the cassette meter is 23 to 28 g.cm.
4. Make sure the video cassette tape is wound over the retaining guide.
5. Make sure that the tape is not slack nor damaged at both ends.

- **Adjustment (Fig. 1-15)**

1. If the back tension is lower than specified, move the tension spring hook plate ① in the direction of arrow Ⓐ so that the protuberance behind be tight in the hole.
2. If the back tension is higher than specified, move the tension spring hook plate ① in the direction of arrow Ⓑ so that the protuberance behind be tight in the hole.

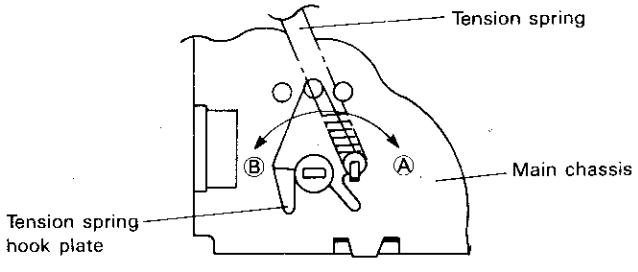


Figure 1-15.

Figure 1-16. Not used.

CHECKING THE BRAKE TORQUE

A) Checking the brake torque at the supply side.

- Checking

1. Remove the cassette housing assembly.
2. Check that the mechanism is in the stop mode.
   Note: The stop mode is brought about by unplugging the power cord with the mechanism in the fast forward or rewind mode.
3. Separate the idler gear from the supply reel disk and place the torque gauge on the supply reel disk.
4. Slowly rotate the torque gauge in the clockwise (CW) direction of the supply brake so that the reel disk and the gauge needle rotate at the same speed. Do the same in the counterclockwise (CCW) direction of the supply brake. Check that the values are within the specified range (CW direction = 280 to 720 g.cm, CCW direction = 110 to 230 g.cm) and that the brake torque in the CW direction is at least twice as high as that in the CCW direction.

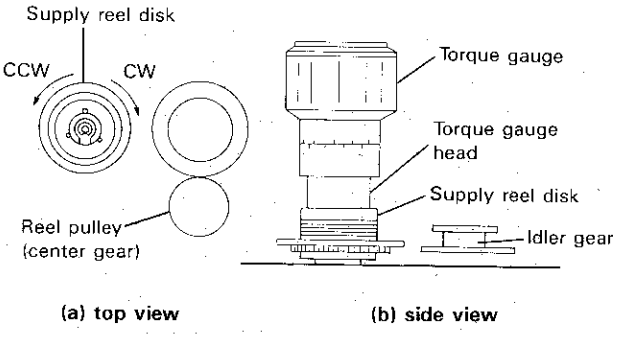


Figure 1-17.

- Adjustment

1. If the supply brake torque is outside the specified range (CW direction = 280 to 720 g.cm, CCW direction = 110 to 230 g.cm), clean the supply reel disk and brake lever felt, then recheck the torque.
2. If the supply brake torque is still outside the specified range, replace the main brake spring.

B) Checking the brake torque at the take-up side.

- Checking

1. Remove the cassette housing assembly.
2. Check that the mechanism is in the stop mode.
   Note: The stop mode is brought about by unplugging the power cord with the mechanism in the fast forward to rewind mode.
3. Separate the idler gear from the take-up reel disk and place the torque gauge on the take-up reel disk.

4. Slowly rotate the torque gauge in the CCW direction of the take-up brake so that the reel disk and the gauge needle rotate at the same speed. Do the same in the CW direction of the take-up brake. Check that the values are within the specified range (CCW direction = 280 to 720g.cm, CW direciton = 90 to 200 g.cm) and that the brake torque in the CCW direction is at least twice as high as that in the CW direction.

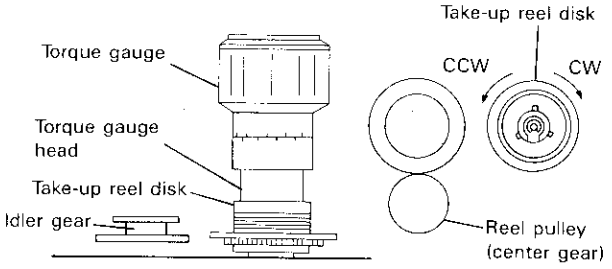


Figure 1-18.

- Adjustment

1. If the take-up brake torque is outside the specified range (CCW direction = 280 to 720g.cm, CW direction = 90 to 200 g.cm), clean the take-up reel disk and brake lever felt, then recheck the torque.
2. If the take-up brake torque is still outside the specified range, replace the main brake spring.

REPLACEMENT OF A/C (Audio/Control) HEAD

Note:

After replacement, perform the adjustment of tape drive train. Under any circumstances avoid touching the head (indicated by"⇒" in Fig. 1-20(c)).

- Replacement (See Figs. 1-19 and 1-20.)

1. Loosen the tilt adjusting screw ⑥ by using Phillips screwdriver.
2. Remove the azimuth adjusting screw ⑤ with a Phillips screwdriver.
3. Remove the A/C head screw ④ with a Phillips screwdriver, paying attention to the spring ⑦ between the A/C head screw ④ and A/C head pedestal.

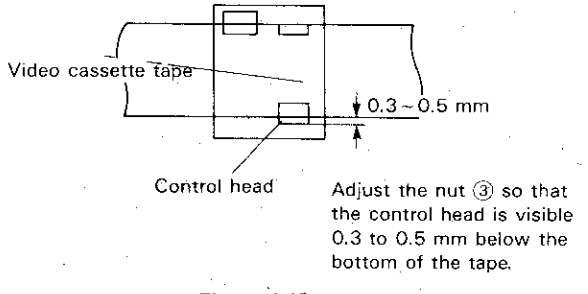

Video cassette tape
0.3 ~ 0.5 mm
Control head
Adjust the nut ③ so that the control head is visible 0.3 to 0.5 mm below the bottom of the tape.

Figure 1-19.

4. Remove the A/C head PWB ⑧ soldered to the A/C head assembly, and solder the A/C head PWB ⑧ onto a new A/C head assembly.
5. The A/C head assembly ① is attached so that the A/C head arm ② and A/C head pedestal are roughly parallel to each other.

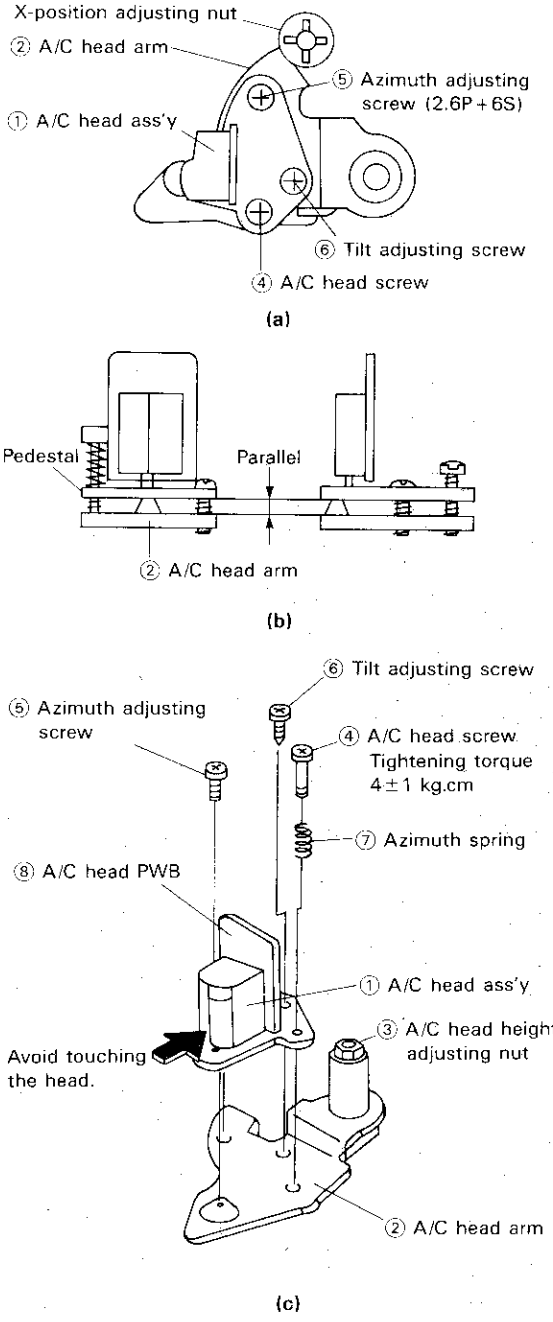


Figure 1-20.

6. Set the A/C head tilt angle according to Fig. 1-22.
7. Play an alignment tape and roughly adjust the height of the A/C head, visually, by turning the A/C head adjusting hexagon nut ③ with the box driver (JiGDRiVER110-7) until the tape comes to the position shown below. (See Fig. 1-19.)
8. Set the mechanism to the loading mode. Place the A/C head tilt adjusting jig on the main chassis as shown in Fig. 1-21. Slowly turn the tilt abjusting screw ⑥ with a Phillips screwdriver until there is no gap between the jig and the A/C head.

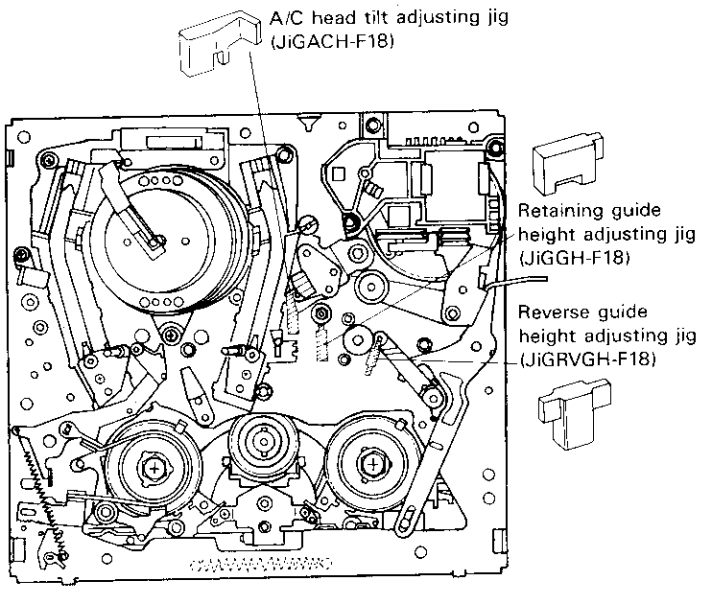


Figure 1-21.

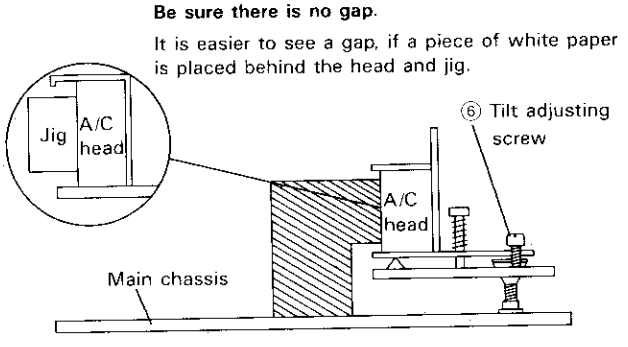

Be sure there is no gap.
It is easier to see a gap, if a piece of white paper is placed behind the head and jig.
Jig
A/C head
⑥ Tilt adjusting screw
A/C head
Main chassis

Figure 1-22.

HEIGHT ADJUSTMENT OF RETAINING GUIDE AND REVERSE GUIDE

- Adjustment

1. Before the rough adjustment of tape drive train, check that the retaining guide and reverse guide heights are within the specified values of Fig. 1-23, by using the special jigs.
2. If the retaining guide height is not correct,adjust the height with the box driver (JiGDRiVER110-4).
3. If the reverse guide height is not correct, use the height adjusting washers.

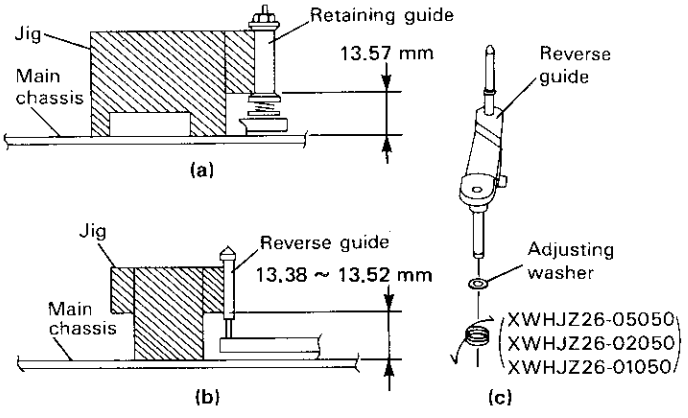


Figure 1-23.

ADJUSTMENT OF TAPE DRIVE TRAIN

1. Check and adjust the position of the tension pole and the back tension.(See pages 15)
2. Set the tilt angle of the A/C head as shown in Fig. 1-22.
   Note:
   If the A/C head is adjusted, check and set the tilt angle as in the case of replacement.
3. When the above adjustments have been completed, roughly adjust the tape drive train using an alignment tape.
   a. Connect the oscilloscope to the test points for PB chroma output (TP501) and head switching pulse (TP502). Allow the PB CHROMA signal to be triggered by the head switching pulse of TP502.
   b. Loosen the setscrew of the guide roller, and tighten it loosely by using the special bladed screwdriver (JiGDRiVERH-4) to such an extent that the guide roller turns smoothly.
   c. Set the alignment tape (VROCPSV) on the reel disk.
   Note:
   Attach a 400 to 500g.weight to the cassette tape when a cassette tape is placed on the reel disk with the cassette housing assembly removed.

d. Place the unit to the playback mode.
e. Observe the waveform of the PB chroma, and push the (+)or(-) tracking button to check for a flat PB chroma. This adjustment is satisfactory if a flat response is obtained on the waveform of the PB chroma when the (+)or(-) tracking button is pushed. If a flat response cannot be obtained roughly adjust the guide roller using the special bladed screwdriver until the PB chroma output is flat.
While keeping the both(+)and(-) tracking buttons down, adjust the X-position adjusting nut so that the PB CHROMA envelope becomes almost maximum. In the case of rough adjustment, pay particular attention to the outlet side (see Fig. 1-24).
f. Adjust the retaining guide height so that the lower flange of the retaining guide touches the bottom edge of the tape. At that time, check that the tape is not curled nor wrinkled.

4. The A/C head height and azimuth are adjusted after rough adjustment of the tape drive train has been done.
a. Use the alignment tape and play back its audio 7kHz signal (monoscope pattern for video signal)and observe the audio output on an oscilloscope.
b. Adjust the azimuth adjusting screw so as to obtain the maximum audio output.
c. Use the alignment tape and play back its audio 1kHz signal (colour bar for video signal) and slowly rotate the A/C head height adjusting nut with the special box driver so as to obtain the maximum audio output.
d. After the height adjustment, use the alignment tape and play back its audio 7kHz signal (monoscope pattern for video signal) again and adjust the azimuth adjusting screw so as to obtain the maximun audio output.
After this adjustment, apply glyptal to the screws and nuts to fix them.

5. The final adjustments of tape drive train and X-position are adjusted after adjustment of the A/C head has been completed.
a. Connect the oscilloscope to the test points for PB chroma output (TP501) and head switching pulse (TP502). Allow the PB CHROMA signal to be triggered by the head switching pulse of TP502.
b. Play back the tape drive train alignment tape (VROCPSV).
c. Finely adjust the guide rolle's height, observing the envelope on the oscilloscope.
Push the (+) or (-) tracking button while adjusting the guide roller, in order to obtain an envelope waveform which is as flat as possible. If the tape is above or below the helical lead, the PB chroma waveform will take the shape shown in Fig. 1-26.
Adjust for maximum flatness of the envelope according to the figure.
Note:
Adjustment is made for CH-1 of switching pulse (low level). The broken lines indicate the envelope waveform when the tape does not run properly.
Push the (+) or (-) tracking button to check the envelope waveform.
After adjustment, tighten the setscrew of the guide roller firmly.
Play back the alignment tape (VROCPSV) again in the unloading mode, and make sure that there is on change in the PB chroma output.

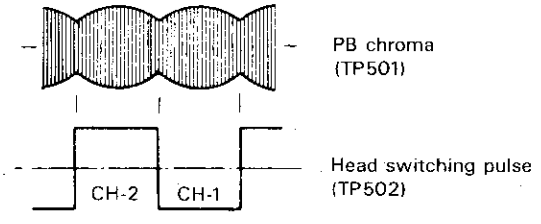


Figure 1-24.

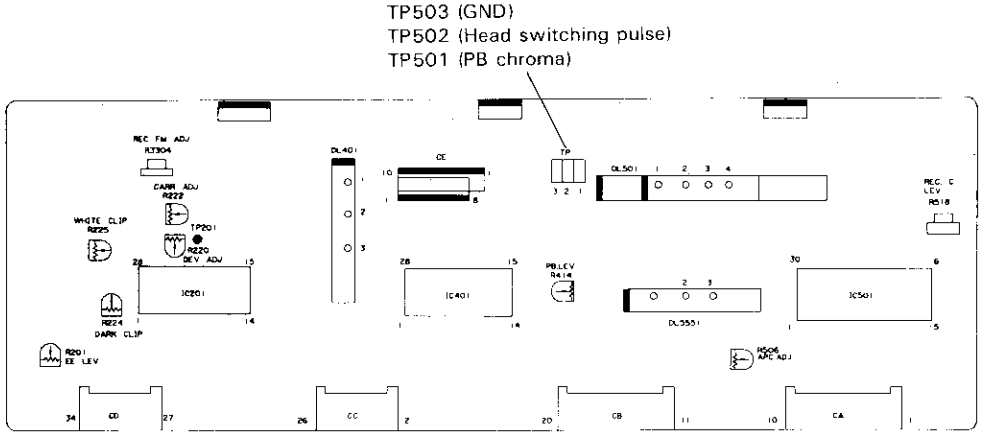


Figure 1-25.

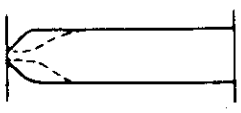
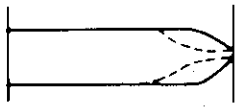
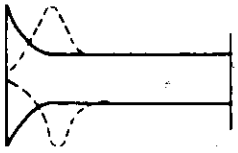
	When the tape is above the helical lead.		When the tape is below the helical lead.	
	Supply side	Take-up side	Supply side	Take-up side
				
				
Adjustment	Supply side guide roller rotated in clockwise direction (lowers guide roller) to flatten envelope.	Take-up side guide roller rotated in clockwise direction (lowers guide roller) to flatten envelope.	Supply side guide roller rotated in counterclockwise direction (raises guide roller) to have the tape float above the helical lead. The supply side guide roller is then rotated in the clockwise direction to flatten the envelope.	Take-up side guide roller rotated in counterclockwise direction (raises guide roller) to have the tape float above the helical lead. The take-up side guide roller is then rotated in the clockwise direction to flatten the envelope.

Figure 1-26.

d. Adjust the retaining guide height so that the lower flange of the retaining guide touches the bottom edge of the tape. At that time, check that the tape is not curled nor wrinkled.
e. The X-position is adjusted after tape drive train adjustment.
Push the (+) and (-) tracking buttons at the same time to set the tracking buttons to the preset mode, and rotate the X-position adjusting nut shown in Fig. 1-27 with the special bladed screwdriver for maximum switching pulse low side envelope, and then adjust the A/C head position. Now adjust the play back switching point to 6.5 ± 0.5H.
Check the flatness of envelope and sound by selfrecording.

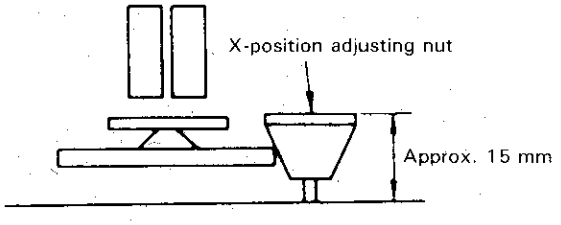


Figure 1-27.

PEPLACEMENT OF UPPER DRUM

Note:

The engagement between the lower drum (outer diameter) and the upper drum(inner diameter) is very accurate, in the order of microns, and care should be paid to their replacement. Even a slight entry of foreign material will affect the accuracy of their reassembly.

- **Replacement (See Fig. 1-28)**

1. Unsolder the leads ① to ④ from the video head and remove them.
2. Remove the two screws ⑤ (brass screws with washers) using a Phillips screwdriver.

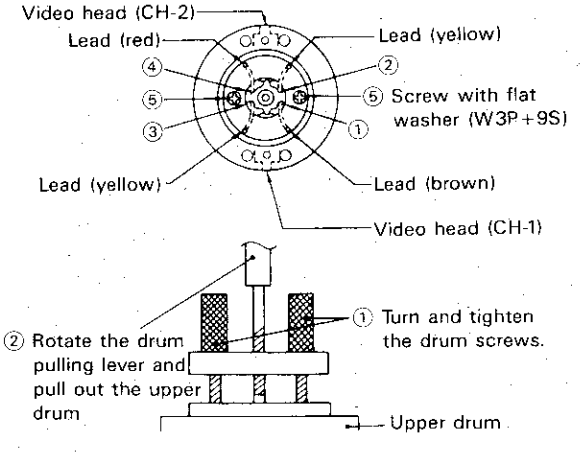


Figure 1-28.

3. Withdraw the upper drum by pulling it up with the upper drum replacement jig.

Notes:
1. Avoid touching the drum surface with bare hands.
2. Do not hit the screws when tightening them.

- Reassembly

1. Set a new drum for replacement, as shown in Fig. 1-28, and position the leads properly.

Notes:
1. Before replacing the upper drum, check that there are no scratches or dust on the edge or the outer surface of the lower drum.
2. Before replacing the upper drum, check that there are no scratches or dust on the edge or the inner surface of the upper drum.
3. On assembling these parts, slowly insert the upper drum onto the lower drum with the upmost care, so that the upper drum is not tilted.
4. When assembling these parts, do not allow foreign material to come between them.
5. Do not use excessive force when driving in the screws.

2. Fasten the upper drum in place with the two screws ⑤
3. Solder the leads ① to ④ at their respective pads.
   Note:
   Soldering should be performed quickly and carefully without touching adjacent patterns.
4. After replacement, be sure to check the tape drive train adjustment and the following.
   - Adjustment of the playback switching point (See page 27).
   - Checking and adjustment of the X-position (See page 28).
   - Adjustment of SP slow tracking preset (See page 27).

REPLACEMENT OF D.D. (DIRECT DRIVE) MOTOR

Note:
Put the unit in the cassette eject position.

- Removal

1. Remove the six screws from the bottom panel and remove the bottom panel.
2. Disconnect the drum D.D. motor lead connector.
3. Remove the two screws① which hold the D.D. rotor assembly in place, using a Phillips screwdriver.
4. Remove the D.D. rotor assembly.
5. Remove the three screws ② which hold the D.D. stator assembly in place, using a Phillips screwdriver.
6. Remove the D.D. stator assembly.

- Reassembly

1. Place the D.D. stator assembly on top of the lower drum.
2. Secure the D.D. stator with the three screws ② using a Phillips screwdriver.

   Note:
   Be careful not to scratch the core, windings or Hall device.
3. Install the D.D. rotor assembly onto the drum shaft.

   Note:
   Install the assembly directly onto the direction of the shaft. (Refer to Fig. 1-29 for the installation direction.)
4. Secure the D.D. rotor assembly with the screws ①.
5. Connect the drum D.D. motor lead connector.
6. Install the bottom panel with six screws.

   Note:
   Be careful not to damage the upper drum or the video head.
7. After replacement of the D.D. motor as shown above, proceed with the adjustment of the playback switching point.

   Notes:
   1. Be careful not to damage the upper drum or the video head.
   2. Be sure that the Hall device and the D.D. stator assembly are not damaged by the D.D. rotor assembly or other parts.

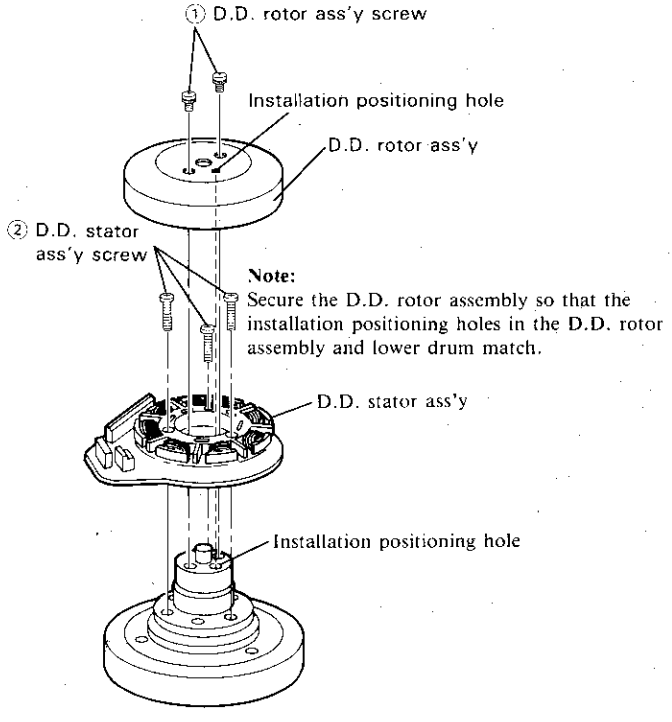

① D.D. rotor ass'y screw
Installation positioning hole
D.D. rotor ass'y
② D.D. stator ass'y screw
Note:
Secure the D.D. rotor assembly so that the installation positioning holes in the D.D. rotor assembly and lower drum match.
D.D. stator ass'y
Installation positioning hole

Figure 1-29.

REPLACEMENT OF THE CAPSTAN D.D. (DIRECT DRIVE) MOTOR

- **Removal**

1. Remove the FFC ① from the capstan D.D. motor control PWB ②.
2. Remove the three screws ③, and remove the capstan D.D. motor ④ from the main chassis.

- **Reassembly**

1. Mount the capstan motor on the main chassis while making sure not to allow the capstan shaft to hit the main chassis, and attach it with the three screws ③.
2. Insert the FFC ① into the capstan D.D. motor control PWB ②.

Notes:

1. After installing the capstan D.D. motor, be sure to rotate the capstan motor and check the movement.
2. Check and adjust the servo circuit.

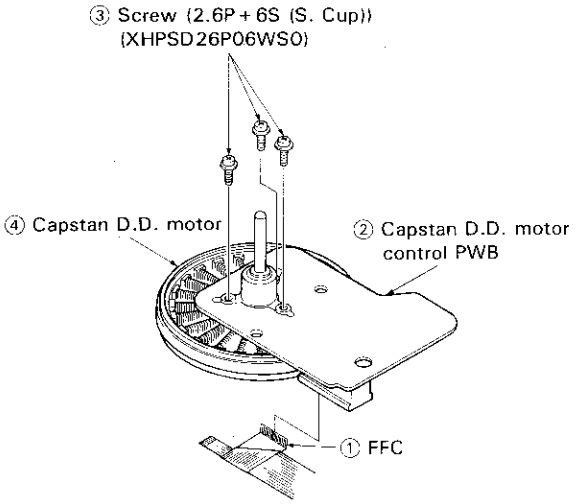


Figure 1-30.

REMOVAL AND REASSEMBLY OF THE LOADING GEAR BLOCK

- **Removal**

1. Remove the slow brake spring ① and slow brake lever ②.
2. Take out the E ring Ⓐ first and then the loading relay gear ③.
3. Rotate the take-up loading gear ④, take-up loading arm assembly ⑤, supply loading gear ⑥ and supply loading arm assembly ⑦ slightly in the loading direction, and take them all out.
4. Finally remove the E ring Ⓑ and relay gear drive lever ⑧.

- **Reassembly**

1. Take the reverse steps of the removal.
2. In reassembling, match the tally marks on t gears, as shown in Fig. 1-31

Note:

1. When reassembling, apply grease to the following points; all the gear teeth, all the gear shafts, and the cam groove of loading relay gear which the relay gear drive lever pin comes in.
2. Be careful not to deform the supply/take-up loading arms.
3. Be careful not to stain the felt of the slow brake.
4. Be also careful to keep the outer surface of the capstan D.D. motor ⑨ free from dust and dirt. (If stained, the MR (Magnet Resistor) element ⑩ might be damaged.)
5. Reshape the anti-fall hooks of the slow brake, supply/take-up loading gears as required. Avoid reshaping too much.

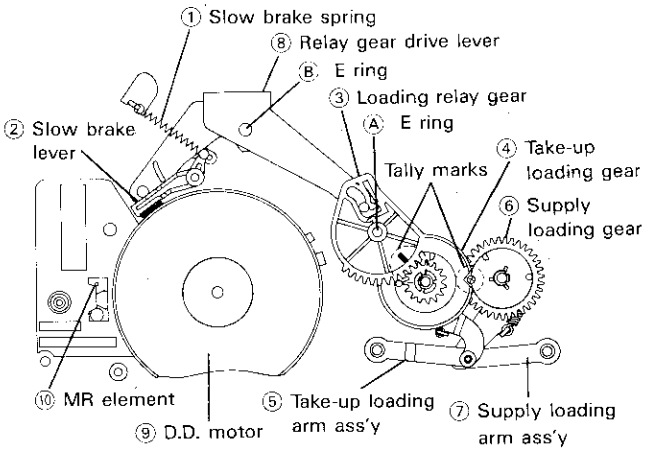


Figure 1-31.

REMOVAL AND REASSEMBLY OF LOADING BLOCK

- **Removal**

1. Remove the leads and the cassette loading belt from the loading block.
2. Unscrew the three screws ③, and pull up and remove the loading block.

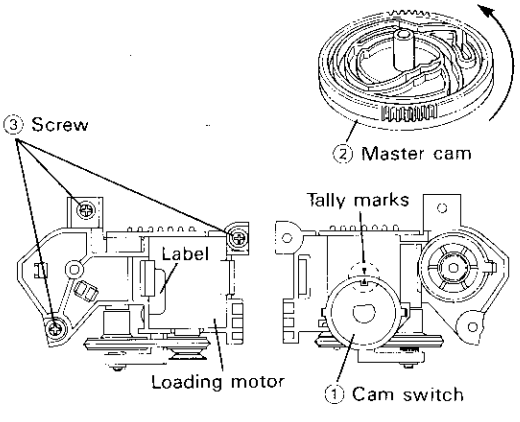


Figure 1-32.

- **Reassembly**

1. Turn the master cam ② all the way counter-clockwise.
2. Match the tally mark on the cam switch ① with the mating mark. Fit the loading block and the master cam with each other. Tighten up the three screws.
3. Finally connect the leads and apply the cassette loading belt.

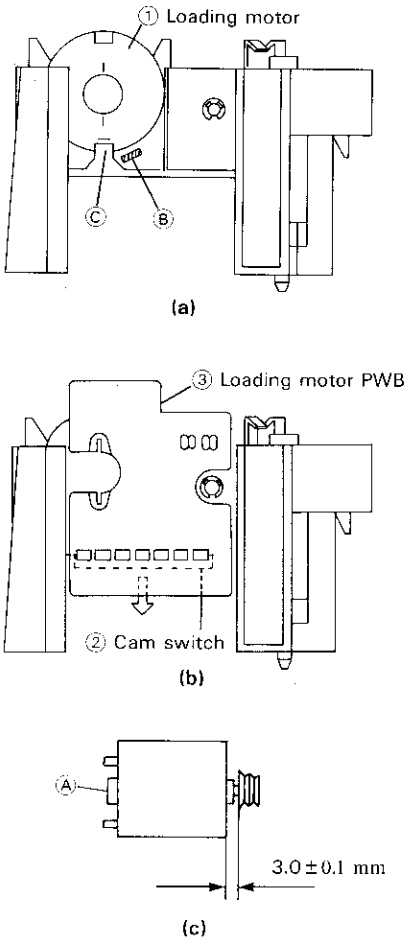
Notes:

1. Be careful not to scratch the gear.
2. Be careful not to stain the belt. If dirty, clean it up.

REPLACEMENT OF LOADING MOTOR

- **Removal**

1. Remove the loading block.
2. Undo the loading belt.
3. Unsolder the leads from the loading motor ①.
4. Unlock the left and right catches of the cam switch ② off the loading block. Take out the loading block PWB ③.



Note:

1. Press-fit the loading motor pulley to the dimension specified in Fig. 1-33(c).
2. Keep the pressure on the part Ⓐ (see above) less than 5 kg.

Figure 1-33.

5. Put the tip of a bladed screwdriver or the like into the opening Ⓑ shown in Fig. 1-33 (a). Pry up the back end of the loading motor ① and take out the motor.

- **Reassembly**

1. Place the loading motor so that its label is visible as ahown in Fig. 1-32.
   Note:
   Make sure that the screw hole at the motor shaft and the protuberance on the loading block are properly engaged and that the notch at the loading motor end and the part Ⓒ of the loading block are also fitted together.
2. Set up the loading block PWB ③ and the cam switch ② in position.
3. Resolder the leads to the loading motor.
4. Finally place the loading block in position.

REPLACEMENT OF MASTER CAM

- **Removal**

1. Remove the loading block.
2. Remove the E ring Ⓐ and then the half-loading reciprocating lever ①.
   Note:
   There is no need to take out the half-loading drive lever.
3. Remove the E ring Ⓑ first and then the pinch roller lever ②.
4. Finally pull out the master cam ③ upward.

- **Reassembly**

1. Place the relay gear drive lever in the unloading state as shown in Fig. 1-31.
2. Set the relay shifter lever ④ to the main chassis; the shifter lever should be adjusted to the reverse guide spring hole in the main chassis. Then place the master cam so that the cut-off part of the boss Ⓒ should face the direction of arrow ⇒ Ⓔ.
3. Place the half-loading reciprocating lever ① so that its cam follower comes in the outermost cam groove. Now attach the E ring Ⓐ.
   Note:
   Preferably hook the half-loading reciprocating spring ⑤ before attaching the lever. It is easier to set up.
4. Turn the master cam ③ somewhat clockwise until the pinch roller lever's cam follower comes into the master cam's groove Ⓓ. Then attach the E ring Ⓑ.
5. Rotate the master cam ③ by hand to make sure all the four levers (relay gear drive lever, relay shifter lever, half-loading reciprocating lever and pinch roller lever) are right in the cam grooves.
6. Finally set up the loading block.

Notes:

1. Be careful not to scratch the teeth and grooves of the master cam.
2. Before placing the loading block, be sure to rotate the master cam by hand to make sure the levers are right in their respective positions. Otherwise the master cam and the levers might get damaged when the motor starts.
3. Apply grease to the master cam's grooves and teeth.

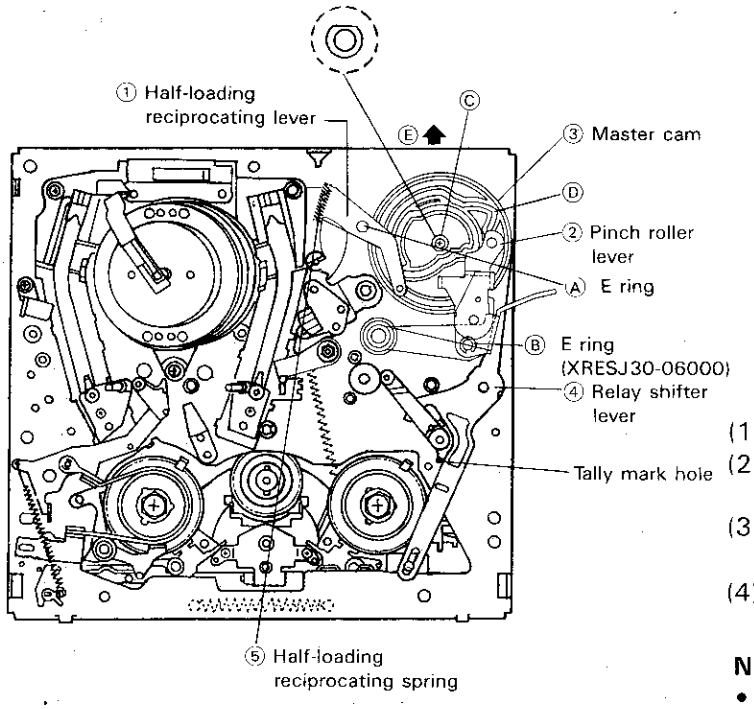


Figure 1-34.

HOW TO UNLOAD THE CASSETTE MANUALLY

1. To unload the cassette the common way.

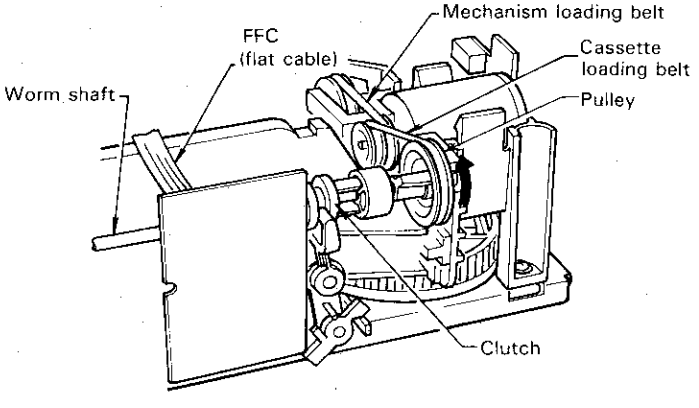


Figure 1-35.

(1) Turn the pulley in the direction of arrow. (By this, the clutch becomes engaged to eject the cassette.)

Notes:

- Do not touch the worm shaft. Just turn the pulley, and the worm shaft will rotate together.
- Carefully turn the pulley if the unit is equipped with the half-loading lever. Otherwise the cassette tape may get loose.

2. To unload the cassette by activating the cassette housing control.

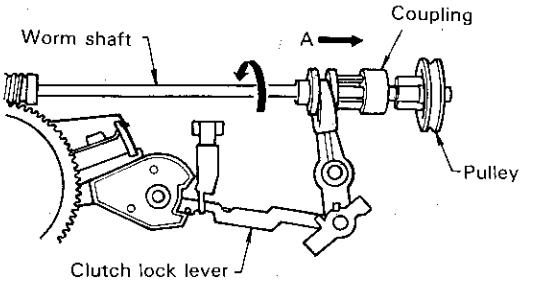


Figure 1-36.

(1) Remove the cassette loading belt.
(2) Turn the coupling in the direction of arrow until the cassette comes up.
(3) Press the clutch in the direction A to get the clutch engaged.
(4) Now turn the worm shaft all the way in the same direction of arrow to take out the cassette.

Notes:

- Carefully turn the worm shaft if the unit is equipped with the half-loading lever. Otherwise the cassette tape may become loose.
- If the second method (activating the cassette housing control) is carried out, the cassette housing control and the mechanism come out of phase from each other. Take the following steps to get in phase with the cassette housing control.

(1) Remove the cassette loading belt and the flat cable.
(2) Turn the power on. The mechanism will automatically be in the eject mode and get in phase with the cassette housing control.
(3) Unplug the power cord.
(4) Make sure the cassette housing stays in the eject mode. Apply the cassette loading belt and connect the flat cable.
(5) Plug in the power cord. Finally load the cassette and eject it to make sure the motion is perfect. (This loading and ejection makes for proper phasing.)

- If the tape has not been fully rewound, remove the bottom panel of the unit and turn the capstan D.D. motor rotor or the reel pulley in the direction of arrow B to wind up the tape. Now you can take out the cassette without damaging the tape.
- Before taking the above measure, be sure to unplug the power cord.

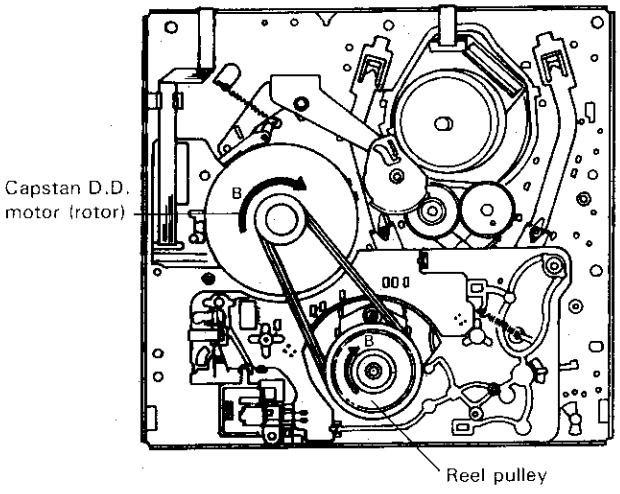


Figure 1-37.

ADJUSTMENT OF ELECTRICAL CIRCUITRY

Prior to the adjustment:
In most cases, necessity for electrical circuits will arise from replacement of mechanical parts including the video head. Before starting adjustment of electrical circuits, check that mechanical operation of the equipment is complete (the mechanism are adjusted completely).

If the equipment fails electrically, locate a defect or defects first of all using instruments. Then repair or replace parts and make adjustment by the procedures described below.
When required instrumetns are not available, do not move controls indiscriminately.

- **Instruments**
  - Colour monitor TV
  - DC regulated power supply
  - VTVM
  - Oscilloscope
  - Audio generator
  - Colour bar generator
  - Alignment tape
  - Frequency counter
  - Blank video tape(VHS)

ADJUSTMENT OF MAIN (SERVO, SYSTEM CONTROL, TUNER) CIRCUIT

- **Test points layout**

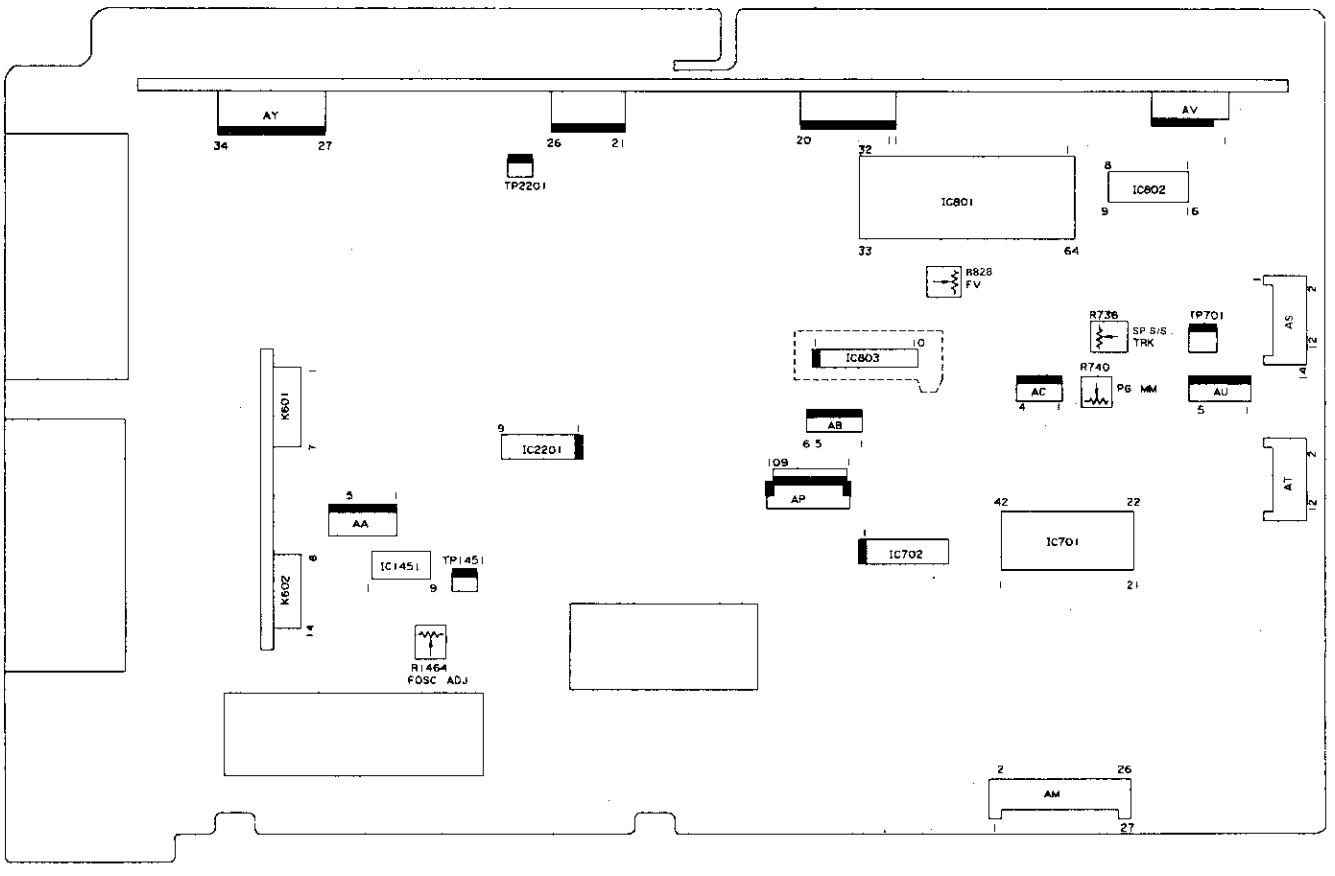


Figure 2-1. MAIN PWB

- If the tape has not been fully rewound, remove the bottom panel of the unit and turn the capstan D.D. motor rotor or the reel pulley in the direction of arrow B to wind up the tape. Now you can take out the cassette without damaging the tape.
- Before taking the above measure, be sure to unplug the power cord.

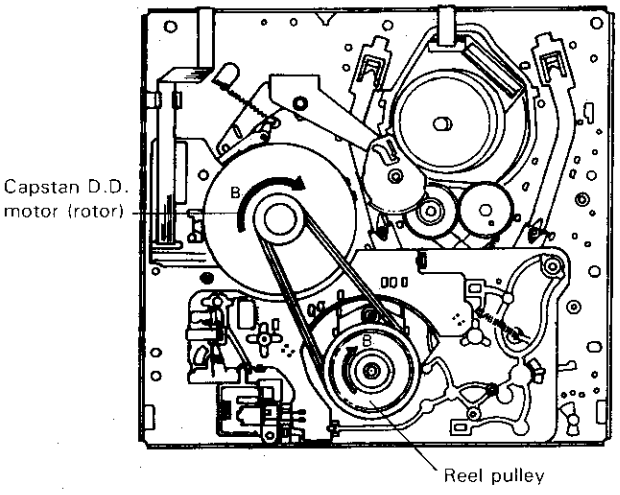


Figure 1-37.

ADJUSTMENT OF SERVO CIRCUIT

Adjustment of playback switching point

Measuring instrument	Oscilloscope
Mode	Playback Tracking button at center
Tape used	Alignment tape (VROCPSV)
Test point	CH-1; TP701 CH-2; Video output terminal (CH-1 trigger slope switch at(+), Internal trigger at CH-1 side)
Adjusting point	R740(phase generator MM control)
Specification	6.5 ± 0.5H

1. Insert the alignment tape (VROCPSV) and put the unit in the playback mode.
2. Set the tracking button to the center position.
3. Adjust R740 (phase generator MM control) so that the waveform on the oscilloscope screen be as shown in Fig. 2-2.

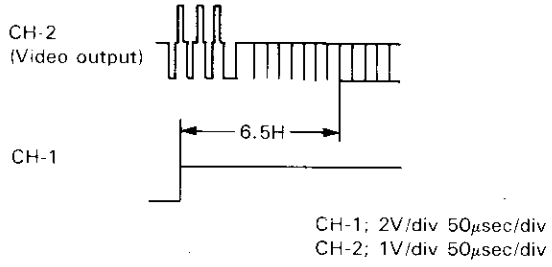


Figure 2-2.

Adjustment of SP slow tracking

Measuring instrument	Monitor TV
Mode	Record time switch at SP Position. Recording and playback on self-recording tape.
Input signal	Commercial broadcast or video signal (external input selector switch)
Test Point	Monitor screen
Adjusting point	R736 (SP slow tracking control)
Specification	No noise bar on the monitor TV screen

1. Receive a commercial broadcast signal, or feed the video signal to the video input terminal (with the external input selector switch).
2. Set the record time switch to the SP position. Make recording and playback on the self-recording tape.
3. Press the slow button and play back the recorded portion in the slow mode.
4. Set the tracking button to the center position.
5. Observing the monitor screen, adjust the SP slow tracking preset control (R736) until the noise bar disappears form the screen.
6. Press the playback button to play back the tape. Then push the pause/still button to reproduce the recording in the still mode. Now make sure there is no noise on the screen. (Repeat this step three times or so.)

Adjustment of still picture vertical sync

Measuring instrument	Monitor TV
Mode	Still picture playback
Tape used	Self-recording tape
Test point	Monitor screen
Adjusting point	R828 (still picture vertical sync control)
Specification	No vertical jitter

1. Play back the tape self-recorded in the SP mode.
2. Press the pause/still button to reproduce the recording in the still mode.
3. Observing the monitor screen, adjust the still picture vertical sync control (R828) until the vertical jitter disappears form the screen.

Precaution in adjusting the X position

Measuring instrument	Oscilloscope
Mode	Playback
Tape used	Alignment tape(VROCPSV)
Test point	Pin ② of TP701 (tracking monitor output)
Adjusting point	————
Specification	T = 14.78 ± 0.46 msec.

Tracking monitor output (TP701)

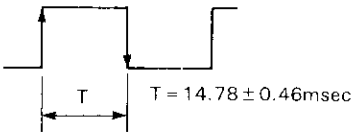


Figure 2-3.

1. Insert the alignment tape (VROCPSV) and put the unit in the palyback mode.
2. Set the tracking button to the center position.
3. Make sure that the "H" level time (T) at Pin ② of TP701 (tracking monitor output) is 14.78 ± 0.46 msec.

ADJUSTMENT OF Y/C CIRCUIT

- Test point layout

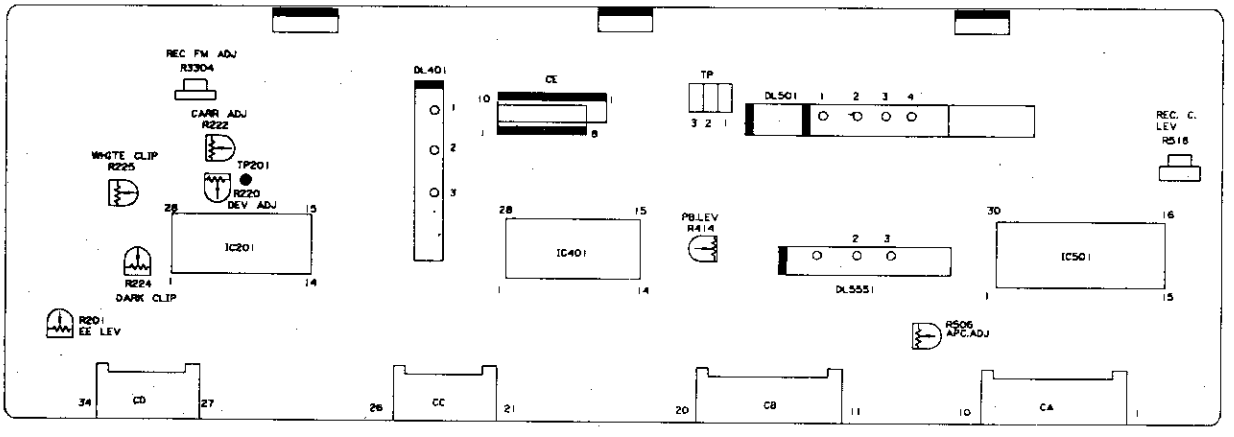


Figure 2-4. Y/C PWB

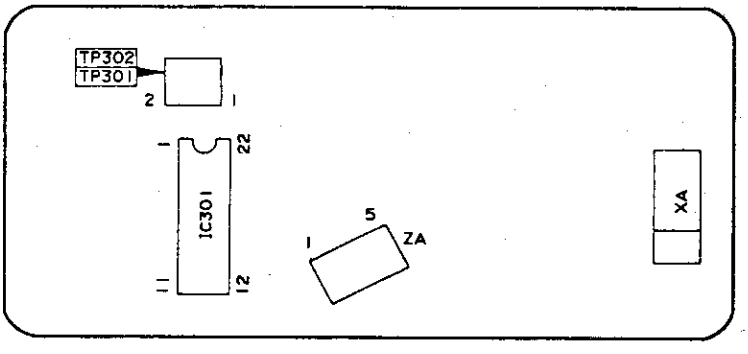


Figure 2-5. HEAD AMP PWB

■ ADJUSTMENT OF Y/C RECORDING CIRCUIT

Adjustment of EE level

Measuring instrument	Oscilloscope
Mode	SP recording
Input signal	Standard colour bar (stair-case waveform)
Test point	Video output terminal
Adjusting point	R201 (EE level control)
Specification	1.0 ± 0.05 Vp-p

Note:
The video output terminal should be terminated with a 75-ohm impedance.

1. Set the unit to the SP record mode.
2. Feed the colour bar signal (stair-case waveform) to the video input terminal. Observing the voltage across the terminal resistor of the video output terminal on the oscilloscope screen, adjust R201 (EE level control) to obtain the value indicated in Fig. 2-6.

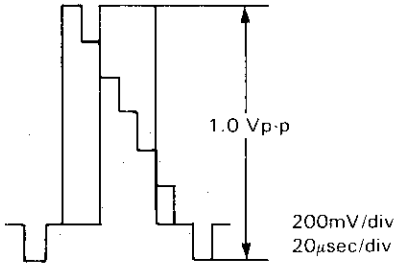


Figure 2-6.

Ajustment of FM 3.8 MHz and 4.8 MHz

Measuring instrument	Frequency counter	Oscilloscope
Mode	Recording	Self-recording / playback
Input signal	External input (no signal)	Standard colour bar (stair-case waveform)
Test point	Pin (28) of IC201	Video Signal
Adjusting point	R222 (FM carrier control)	R220 (deviation control)
Specification	3.8 MHz	1.0 ± 0.05 Vp-p

Note. 1:
Carry out this adjustment only when IC201 has been replaced or when the carrier setting (3.8 MHz) or the deviation (4.8 MHz) is found apparently out of specification.

Make this adjusment after the EE level has been completely adjusted.

Note. 2:
The video output terminal should be terminated with a 75-ohm impedance.

1. First make sure that the EE level playback video signal is at the speciffied level.
2. Place the unit in the record mode and get it ready for external input.
   Note:
   Do not connect anything to the external input terminal.
3. Hook up the frequency counter to pin (28) of IC201. Adjust R222 (FM carrier control) so that the counter reading be 3.8 MHz.
   Note:
   Make sure the white and dark clip controls are not now applied to the waveform.
4. Feed the colour bar signal (stair-case waveform) and make self-recording and playback.
5. Observe the video output terminal voltage (across the terminal resistor) on the oscilloscope screen. If the playback video signal level is below 1.0 Vp-p, turn R220 (deviation control) clockwise. If above 1.0 Vp-p, turn the control counter-clockwise. Now make self-recording and playback again.
6. Repeat the above step 5 to finally get the playback video signal level at 1.0 ± 0.05 Vp-p, as shown in Fig. 2-5.

Adjustment of white clip

Measuring instrument	Oscilloscope
Mode	Recording
Input signal	Standard colour bar (stair-case waveform)
Test point	TP201
Adjusting point	R225 (white clip control)
Specification	$80\ ^{+0}_{-4}$ %

1. Place the unit to the record mode.
2. Feed the colour bar (stair-case waveform) signal.
3. Observing the output at TP201, adjust R225 (white clip control) so that the white peak overshoot be 80 (tolerance +0−4)%.

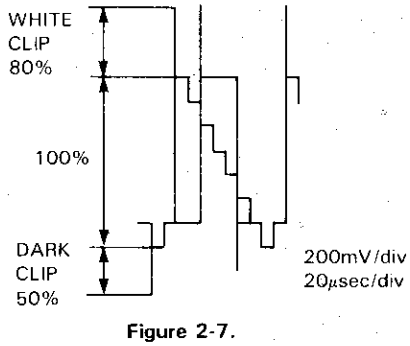


Figure 2-7.

Adjustment of dark clip

Measuring instrument	Oscilloscope
Mode	Recording
Input signal	Standard colour bar (stair-case waveform)
Test point	TP201
Adjusting point	R224 (dark clip control)
Specification	50 ± 4%

1. Place the unit to the recording mode.
2. Feed the colour bar (stair-case waveform) signal.
3. Observing the output at TP201, adjust R224 (dark clip control) so that the dark peak overshoot be 50 ± 4%. (See fig. 2-7.)

Adjustment of recording current

Measuring instrument	Oscilloscope	
Mode	Recording	
Input signal	Standard colour bar (stair-case waveform)	
Test point	TP301 (GND at TP302) External trigger (video output terminal)	
Adjusting point	R3304 (recording FM control)	R518 (recording chroma control)
Specification	Sync tip level 140 ± 10mVp-p	Red level 24 ± 1mVp-p

Note:
TP301 and TP302 are located on the head amp PWB.

1. Place the unit to the record mode.
2. Feed the colour bar (stair-case waveform) signal.
3. Observing the waveform on the oscilloscope screen (external trigger at video output terminal), take the following steps.
   a) Connect the oscilloscope's GND and SIG leads to TP302 and TP301, respectively.
   b) Turn R3304 (recording FM control) to minimum.
   c) Adjust R518 (recording chroma control) to that the red level be 24 ± 1mVp-p as shown in Fig.2-8.
4. Adjust R3304 (recording FM control) so that the sync tip be 140 ± 10mVp-p as shown in Fig.2-9.

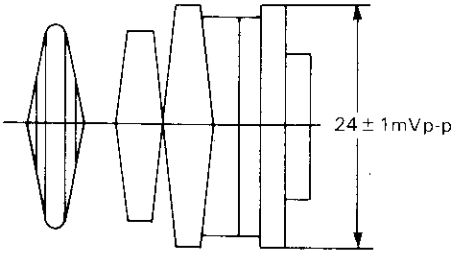


Figure 2-8.

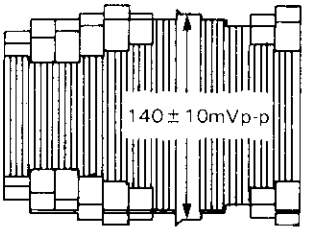


Figure 2-9.

■ ADJUSTMENT OF Y/C PLAYBACK CIRCUIT

Adjustment of playback video signal level

Measuring instrument	Oscilloscope
Mode	Playback
Tape used	Alignment tape (stair-case waveform)
Test point	TP201
Adjusting point	R414 (playback level control)
Specification	1.0 ± 0.05Vp-p

Note:
The video output terminal should terminated with a 75-ohm impedance.

1. Insert the alignment tape (stair-case waveform) and place the unit to the playback mode.
2. Hook up the oscilloscope to the video output terminal. Adjust R414 (playback level control) so that the on-screen waveform be 1.0 ± 0.05Vp-p.

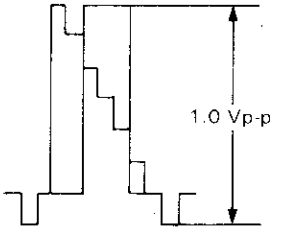


Figure 2-10.

Adjustment of APC

Measuring instrument	Frequency counter
Mode	Playback
Tape used	Alignment tape (VROCPSV)
Test point	Pin ⑦ of CA connector
Adjusting point	R506
Specification	4.433619MHz ± 50Hz

1. Insert the alignment tape (VROCPSV) and place the unit to the playback mode.
2. Connect the frequency counter to pin ⑦ of CA connector. Adjust R506 (APC control) so that the counter reading be 4.433619MHz ± 50Hz.

ADJUSTMENT OF AUDIO CIRCUIT

- **Test point layout**

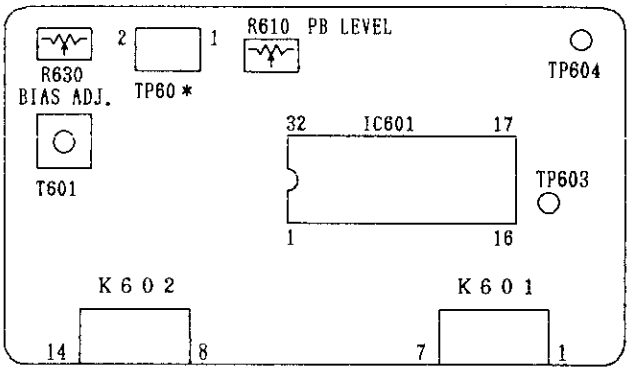


Figure 2-11. AUDIO PWB

Adjustment of playback level

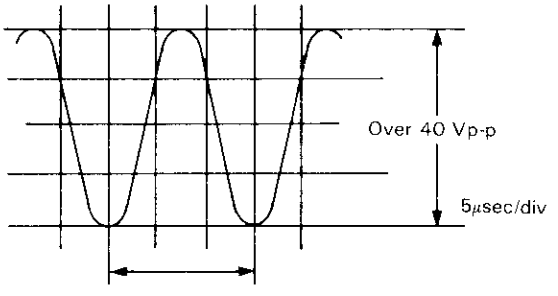
Measuring instrument	VTVM
Mode	Playback
Input signal	Alignment tape (VROCPSV) (1-kHz level control signal)
Test point	Audio output terminal
Adjusting point	R610 (playback level control)
Specification	-8 ± 0.5dBm

1. Play back the alignmenr tape (1-kHz level control signal).
2. Hook up the VTVM to the audio output terminal.
3. Adjust R610 (playback level control) so that the output level be -8 ± 0.5dBm.

Checking of erase voltage and oscillation frequency

Measuring instrument	Oscilloscope
Mode	Recording
Input signal	————
Test point	Both ends of the full-erase head
Adjusting point	————
Specification	Erase voltage; Over 40 Vp-p Oscillation frequency; 70 ± 7kHz

1. Place the unit to the record mode.
2. Hook up the oscilloscope to both ends of the full-erase head.
3. Make sure the erase voltage is over 40 Vp-p.
4. Be sure that the oscillation frequency is 70 ± 7kHz.



63 kHz to 77 kHz about three divisions

Figure 2-12.

Adjustment of bias current

Measuring instrument	VTVM
Mode	Recording
Input signal	————
Test point	TP601 (SIG), TP602 (GND)
Adjusting point	R630 (bias current control)
Specification	260 ± 10 μA

1. Place the unit to the record mode.
2. Connect the VTVM to TP601 (SIG) and TP602 (GND).
3. Adjust R630 (bias current control) so that the bias current be 260 ± 10 μA (2.6 ± 0.1mV).

Checking of recording level

Measuring instrument	VTVM
Mode	Self-recording/playback
Input signal	1 kHz/−3.8 dBm
Test point	Audio output terminal
Adjusting point	————
Specification	−3.8±3 dBm

1. Feed 1 kHz, −3.8 dBm signal to the audio input terminal. Make self-recording and playback of the signal.
2. Make sure the output at the audio output terminal is −3.8±3 dBm.
3. If out of spec, readjust the playback level and the bias current.

ADJUSTMENT OF IF CIRCUIT

Adjustment of RF AGC

Measuring instrument	Oscilloscope Signal generator
Mode	————
Input signal	Colour bar signal
Test point	Video output terminal
Adjusting point	VR001 (on IF pack)

1. Receive the colour bar signal (input field strength: 80 dBμ).
2. Observe the video output terminal waveform on the oscilloscope. Adjust VR001 (on IF pack) in the IF pack until the noise disappers from the oscilloscope screen and the waveform nearly comes into sync.

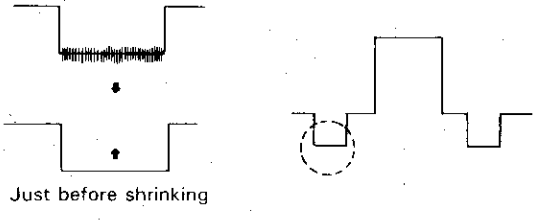


Figure 2-13.

Adjustment of AFT

Measuring instrument	Oscilloscope Signal generator
Mode	————
Input signal	PIF frequency uniwave (39.5 MHz ± 1 kHz) Colour bar signal (70 dBμ)
Test point	Video output terminal
Adjusting point	T002 (AFT coil)
Specification	————

1. Receive the colour bar signal (input field strength: 70 dBμ).
2. First set the band selector switch to VHF or UHF position.
   Using the signal generator, feed the 39.5-MHz PIF frequency signal (sine wave) to the tuner IF output terminal.
   Use the (−) and (+) keys so that the video output terminal waveform be minimum.
3. Set the band selector switch normal position.
4. Using the signal generator, feed the 39.5-MHz ± 1 kHz PIF frequency signal (sine wave) to the tuner IF output terminal.
   (Adjust the attenuator to attenuate the input signal down to an appropriate level).
5. Adjust T002 (AFT coil) in the IF pack so that the video output terminal waveform be minimum.

Adjustment of PLL frequency of H-sync ID circuit (R1464)

Measuring instrument	Frequency counter
Mode	————
Input signal	Video signal
Test point	TP1451
Adjusting point	R1464
Specification	15.625 kHz ± 50 Hz

1. Connect the frequency counter to pin ③ of TP1451 with a buffer in between, as shown in Fig. 2-14.
2. Add a 1 μF/50V capacitor between pin ① (video signal) and pin ② (GND) of TP1451, as shown in Fig. 2-14.
   (Disconnect this capacitor after the adjustment.)
3. Turn R1464 until the frequency counter reads 15.625 kHz ± 50 Hz.

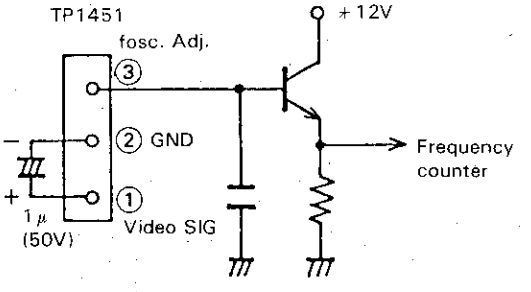


Figure 2-14. Buffer Circuit

TROUBLESHOOTING GUIDE

■ TROUBLES OF CONTROL SYSTEM (SERVO, SYSTEM CONTROLLER CIRCUIT)

No.	Problems	Probable causes and countermeasures
1.	No power is supplied.	• The fuse is blown out; check if there occurs a shortcircuit in the internal circuit. • Check if there are produced AT5V, Motor 12V and AT9V in the power circuit; if not, this means that the power circuit is defective. • Check if the system controller (IC801) is normally functioning; check if there are produced reset signals (ACL) at pin **45** of IC801 and clock signal at pins **46** and **47** of IC801. • Check if the power control signal (Low level) goes out of pin **19** of IC801.
2.	No operation is available.	• Check if the end sensor signal (cassette housing side) and start sensor signal are applied to pins **56** and **57** of IC801 respectively. • Check if the unit is in timer mode. • Check if the unit is in sensor stop mode. • The cam switch is poorly adjusted for its positioning.
3.	After tape lading, the unit is stopped with the tape kept wound over the drum, or the cassette can't be ejected.	• The cam switch is poorly adjusted for its positioning. • IC803 is defective.
4.	The unit will stop immediately after it is set in playback or record mode.	• Check if the head switching pulse is applied to pin **3** (for the drum sensor) of IC801. • Check if the drum motor is rotating. • Check if the drum phase generator's signal and drum frequency generator's signal are applied to pins **4** and **5** of the servo circuit IC701.
5.	The unit will stop a few seconds after it has been set in playback or record mode.	• Check if the reel sensor pulse is applied to pin **58** (for the reel sensor) of IC801. • Check if the reel motor is rotating. • Check if the reel idler is stained or defective.
6.	The tape is not running (the tape is not taken up).	• The reel idler is defective. • The reel brake is defective.
7.	• The unit stops sometimes during playback or recording. • The tape can't be taken up when tape unloading. • The tape is scratched when it is wound. • Video search is impossible.	• Check if there are produced capstan motor control signals at the system controller (servo clock signal **38** of IC801, servo data signal at **39** of IC801, capstan motor pull up signal at pin **29** of IC801, capstan motor unloading signal at pin **30** of IC801, loading motor control forward signal at pin **63** of IC801, loading motor reverse control signal at pin **62** of IC801). • The video search circuit is defective. • IC701 and IC702 are defective.
8.	Fine noises appear at the reproduced picture.	• The playback phase generator MM control is misadjusted (R740).

No.	Problems	Probable causes and countermeasures
9.	Noises appear intermittently at the reproduced picture.	• Check for capstan servo circuit (capstan frequency generator's signal at pin **11** of IC701 and playback control signal at pin **42** of IC701)
10.	The picture collapses in the horizontal direction.	• The drum servo circuit is defective. • Check if there are drum frequency generator's signal applied to pin **7** of IC701 and drum phase generator's signal to pin **4** of IC701. • Check if there is reference signal (4.43MHz) at pin **22** of IC701.

- TROUBLES OF SOUND AND REPRODUCED PICTURE (Y/C AND AUDIO CIRCUIT)

No.	Problems		Probable causes and countermeasures
1.	No picture appears.	At E-E mode	• Check if the video signal (E-E signal) is applied to pin **4** of IC201, if the video signal goes out of pin **10**, and if proper voltage is applied to each pin of IC201. • Check if the video signal comes into pin **3** of IC2201 and goes out of pin **8** of IC2201 (in tuner mode). • Check if the E-E (L) signal is at low level at pin **26** of connector AX and pin **7** of IC2201.
		At playback of standard tape.	Make sure that there appears a normal picture at E-E mode. • Check if the playback FM signal is applied to pin 7 of connector CE. • Check if the playback FM signal is applied to pins 19 and 20 of IC301. • Check if Vcc 5V is applied at pin **8** of IC401. • Check if the video signal (demodulator output) is given at pin **16** of IC401. • Check if the video signal is given at pin **1** of IC401. • Check if the base of Q202 is at high level (about 4V).
		At playback of the tape recorded by oneself.	Before this checking, make sure that normal playback is possible with standard tape. • Check if there is FM signal at pin **16** of IC401. • Check if there is video signal at pin **6** of IC201. • Check if there is video signal at pin **10** of IC201.
2.	No colour appears.		• Check if there is chroma signal at pin **30** of IC501. • APC is misadjusted (R506). It is not allowed to readjust them, this means that IC501 is defective. • Check if IC501 is normally functioning.
3.	The picture collapses when the tape recorded by oneself is played back.		• Check if there is a normal voltage at each pin of the head amplifier.
4.	Noises appear on the whole of picture when the tape recorded by oneself is played back.		• Check if there is a normal voltage at each pin of the head amplifier • Check the video head or replace it a new one.

No.	Problems	Probable causes and countermeasures
5.	Noises is noticeable at E-E mode or when the tape recorded by oneself is played back.	• The tuner and/or RF converter are defective. • Check if AT 5V is applied at pin **5** of the RF converter. • Check the coaxial cable between the tuner and the RF converter for breakage. • Disconnect the antenna cable to see if the DC voltage at the tuner's AGC terminal goes above 6V.
6..	Noise appear on the picture when the tape is played back with standard tape.	• Clean the video head or replace it a new one.
7.	There appears no E-E sound.	• First make sure the E-E picture appears as specified.(If not, the muting effect is produced.) • ALC at IC601 operates improperly. • Check if there is audio signal at pin **17** of IC601. • The audio muting circuit is defective.
8.	There appears no sound at playback mode.	• The audio head is defective. • Check if the control signal is applied. (If not, the muting effect is produced.) • Ckeck if playback audio signal is applied to pin **7** of IC601 and goes out of pin **17**.
9.	Sound is distorted.	• The audio head is magnetized or defective. • Bias current is insufficient.
10:	The reasonance in the recording or playback is incorrect.	• The audio head is magnetized or defective. • Bias oscillator circuit is defective.
11.	Recording is impossible.	• Bias oscillator circuit is not normally functioning. • Ckeck if pin **12** of K602 (bias control 9V) is at high level.
12.	Noise and hum appear frequently during playback or recording.	• The audio head is defective.

SCHEMATIC DIAGRAM

IMPORTANT SAFETY NOTICE:
BE SURE TO USE GENUINE PARTS FOR SECURING THE SAFETY AND RELIABILITY OF THE SET. PARTS MARKED WITH "⚠" AND PARTS SHADED (IN BLACK) ARE ESPECIALLY IMPORTANT FOR MAINTAINING THE SAFETY AND PROTECTING ABILITY OF THE SET.
BE SURE TO REPLACE THEM WITH PARTS OF SPECIFIED PART NUMBER.

SAFETY NOTES:

1. *DISCONNECT THE AC PLUG FROM THE AC OUTLET BEFORE REPLACING PARTS.*
2. *SEMICONDUCTOR HEAT SINKS SHOULD BE REGARDED AS POTENTIAL SHOCK HAZARDS WHEN THE CHASSIS IS OPERATING.*

NOTES:

1. *The unit of resistance "ohm" is omitted (k = 1000 ohm, M = 1 Meg ohm).*
2. *All resistors are 1/8 watt, unless otherwise noted.*
3. *The unit of capacitance "F" is omitted (μ = μF, p = μμF).*
4. *The values in parentheses are the ones in the PB mode; the values without parentheses are the ones in the REC mode.*

VOLTAGE MEASUREMENT CONDITIONS:

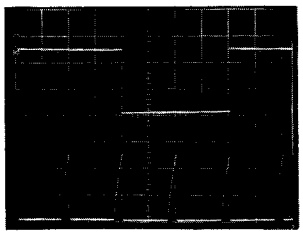
1. *DC voltages are measured between points indicated and chassis ground by VTVM, with AC240V/50Hz supplied to unit and all controls are set to normal viewing picture unless otherwise noted.*
2. *Voltages are measured with 10000μV B & W or colour signal.*

WAVEFORM MEASUREMENT CONDITIONS:
10000μV 87.5 percent modulated colour ber signal is fed into tuner.

CAUTION:
This circuit diagram is original one. Therefore there may be a slight difference from yours.

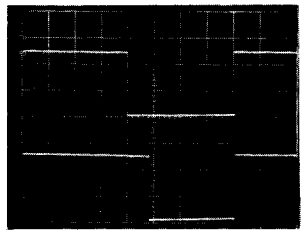
WAVE FORMS

SYSTEM CONTROL, SERVO, IF PWBs



TP701 ① pin
Head switching pulse
2V/Division
5msec/Division

IC701 ㉙ pin
Drum pulse generator
1V/Division
5msec/Division

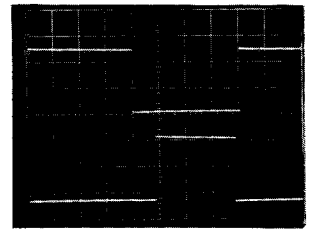


TP701 ① pin
Head switching pulse
2V/Division
5msec/Division

TP701 ② pin
Tracking MM pulse
2V/Division
5msec/Division
– Record mode –

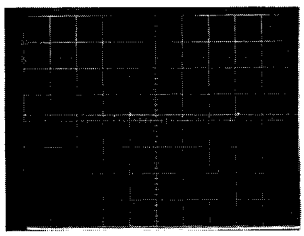
TP701 ③ pin
Playback control pulse
2V/Division
5msec/Division

IC701 ㊷ pin
Playback control signal
500mV/Division
5msec/Division

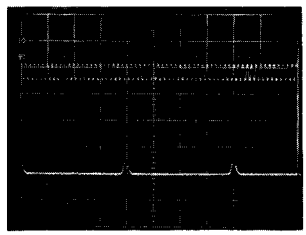


TP701 ① pin
Head switching pulse
2V/Division
5msec/Division

TP701 ② pin
Tracking MM pulse
2V/Division
5msec/Division
– Playback mode –

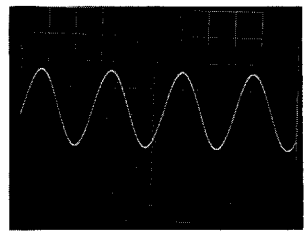


IC701 ㉚ pin
Horizontal sync pulse
1V/Division
5msec/Division

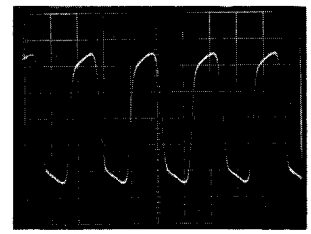


Socket AM ⑨ pin
Drum frequency generator signal
50mV/Division
10msec/Division

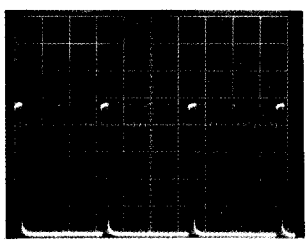
Socket AM ⑫ pin
Drum phase generator pulse
200mV/Division
10mV/Division



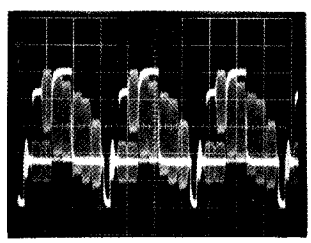
Socket AM ⑮ pin
Capstan frequency generator signal
500mV/Division
0.5msec/Division



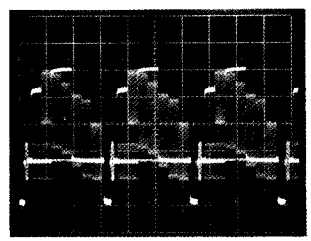
Plug AV ⑧ pin
4.43MHz oscillation signal
200mV/Division
0.1μsec/Division



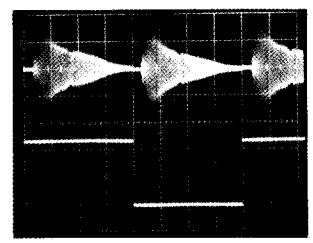
TP2201
Horizontal sync pulse
1V/Division
20μsec/Division
– Record mode –



Video output terminal
(Video output is shorted with a 75 ohm resistor.)
Video signal
200mV/Division
20μsec/Division
– Playback mode –

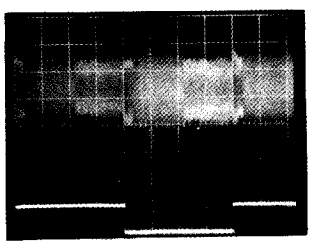


Video output terminal (E-E level)
(Video output is shorted with a 75 ohm resistor.)
Video signal
200mV/Division
20μsec/Division
– Record mode –



TP1
Playback preamp. signal
200mV/Division
5msec/Division

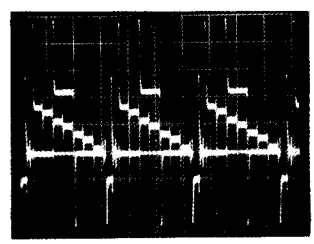
TP2
Head switching pulse
2V/Division
5msec/Division
– Playback mode –
(Sweep tape)



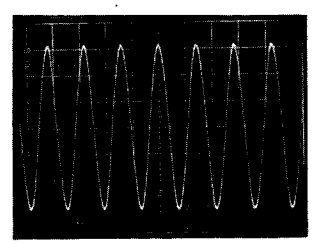
TP1
Playback preamp. signal
50mV/Division
5msec/Division

TP2
Head switching pulse
5V/Division
5msec/Division
– Playback mode –
(color bar)

Y/C, AUDIO PWB

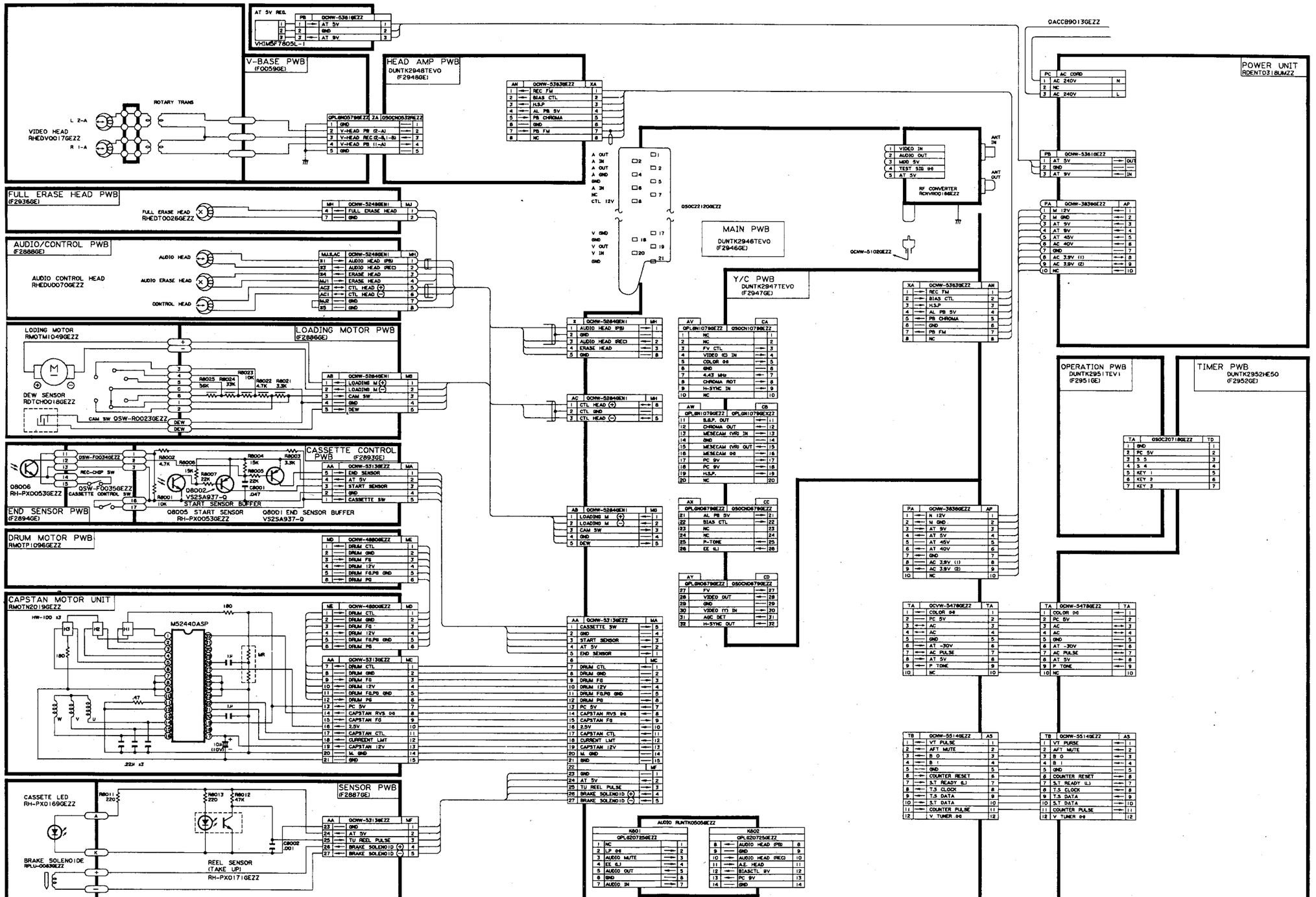


TP201
White/Dark clip signal
100mV/Division
20μsec/Division
– Record mode –



K602 ⑨, ⑪ pin
(Between audio erase head and ground)
10V/Division
10μsec/Division
– Record mode –

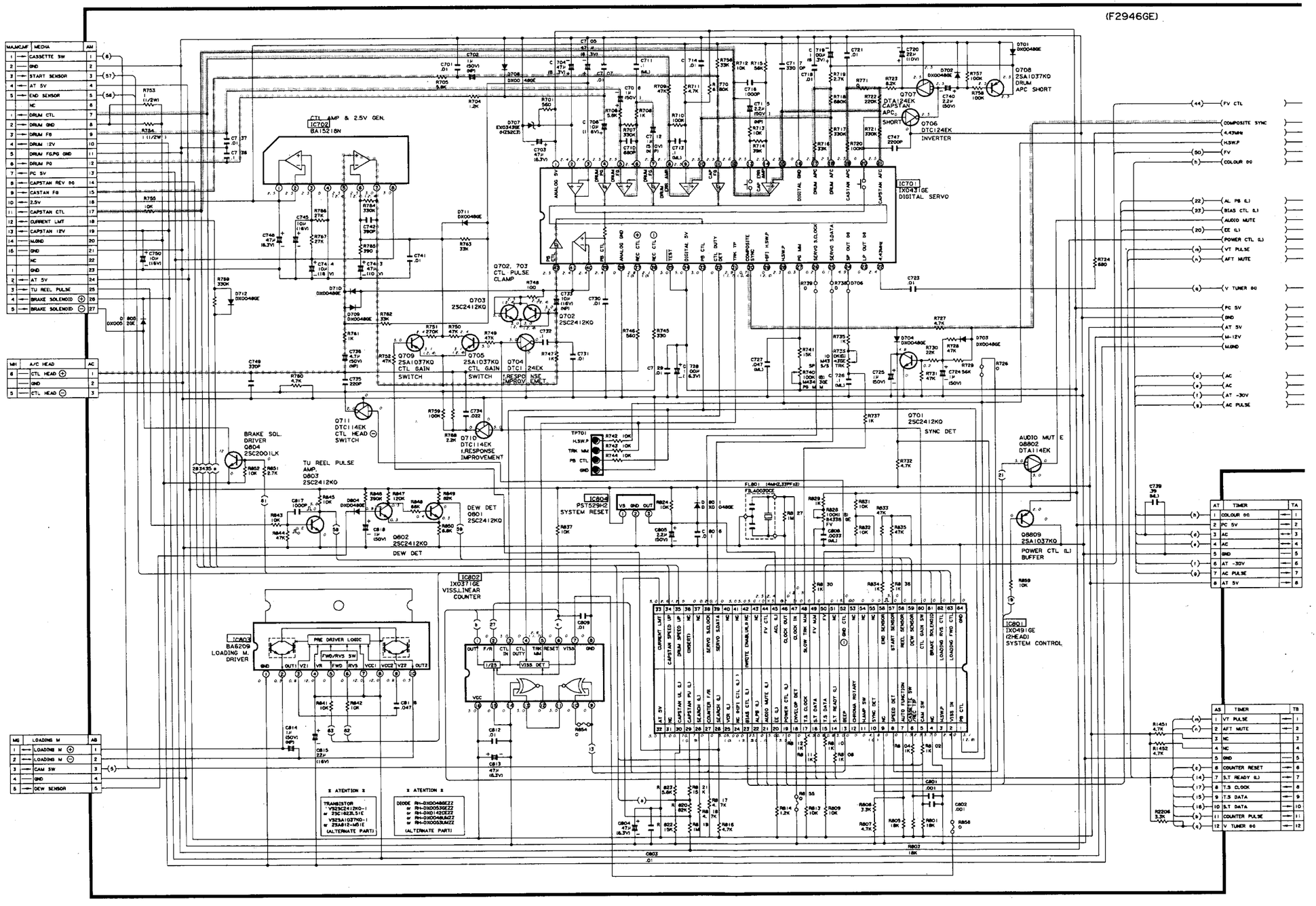
OVERALL DIAGRAM



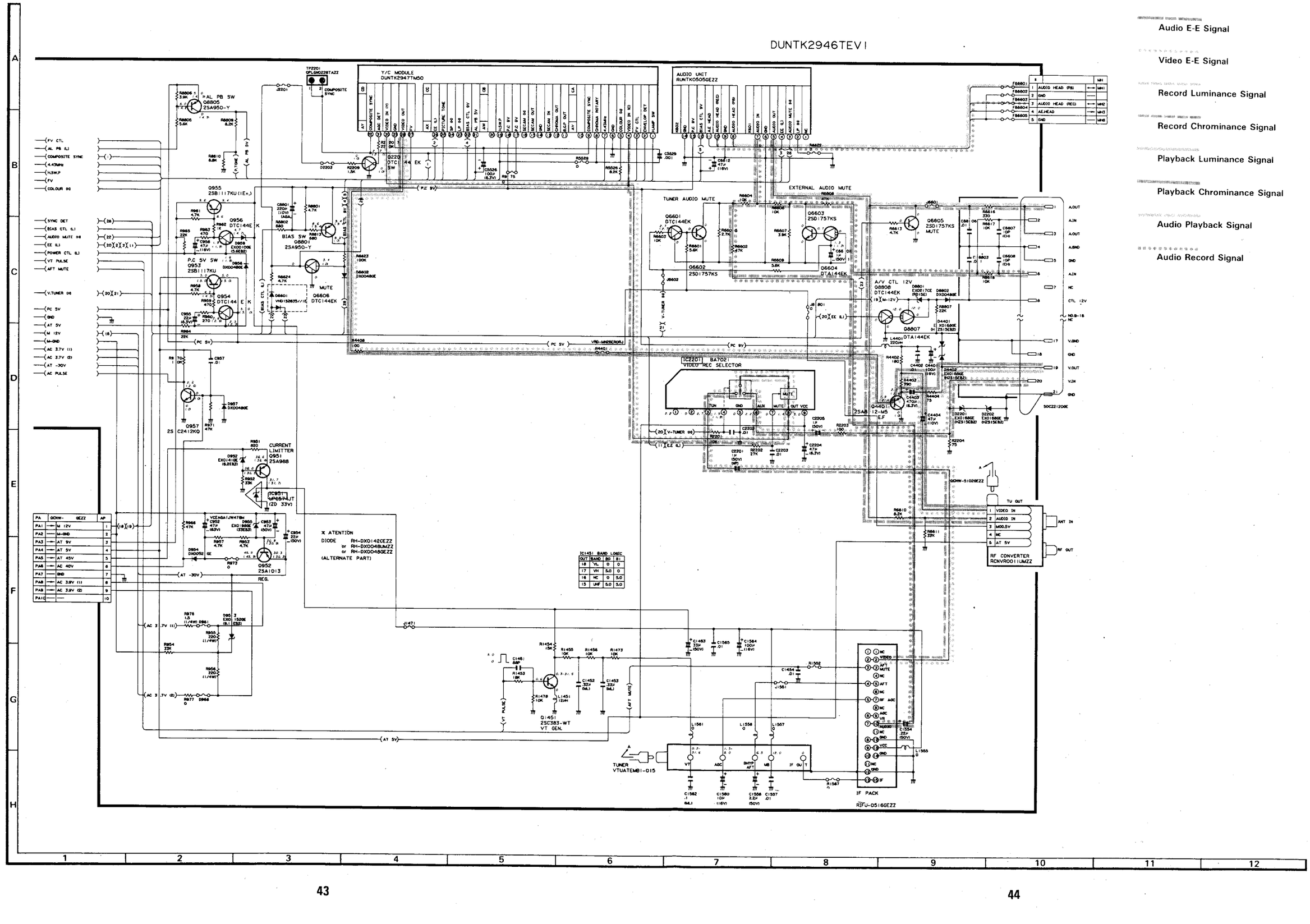
SYSTEM CONTROL, SERVO, IF CIRCUIT

DUNTK2946TEV1

(F2946GE)



DUNTK2946TEV1



Y/C CIRCUIT

DUNTK2947TM50

E-E Signal

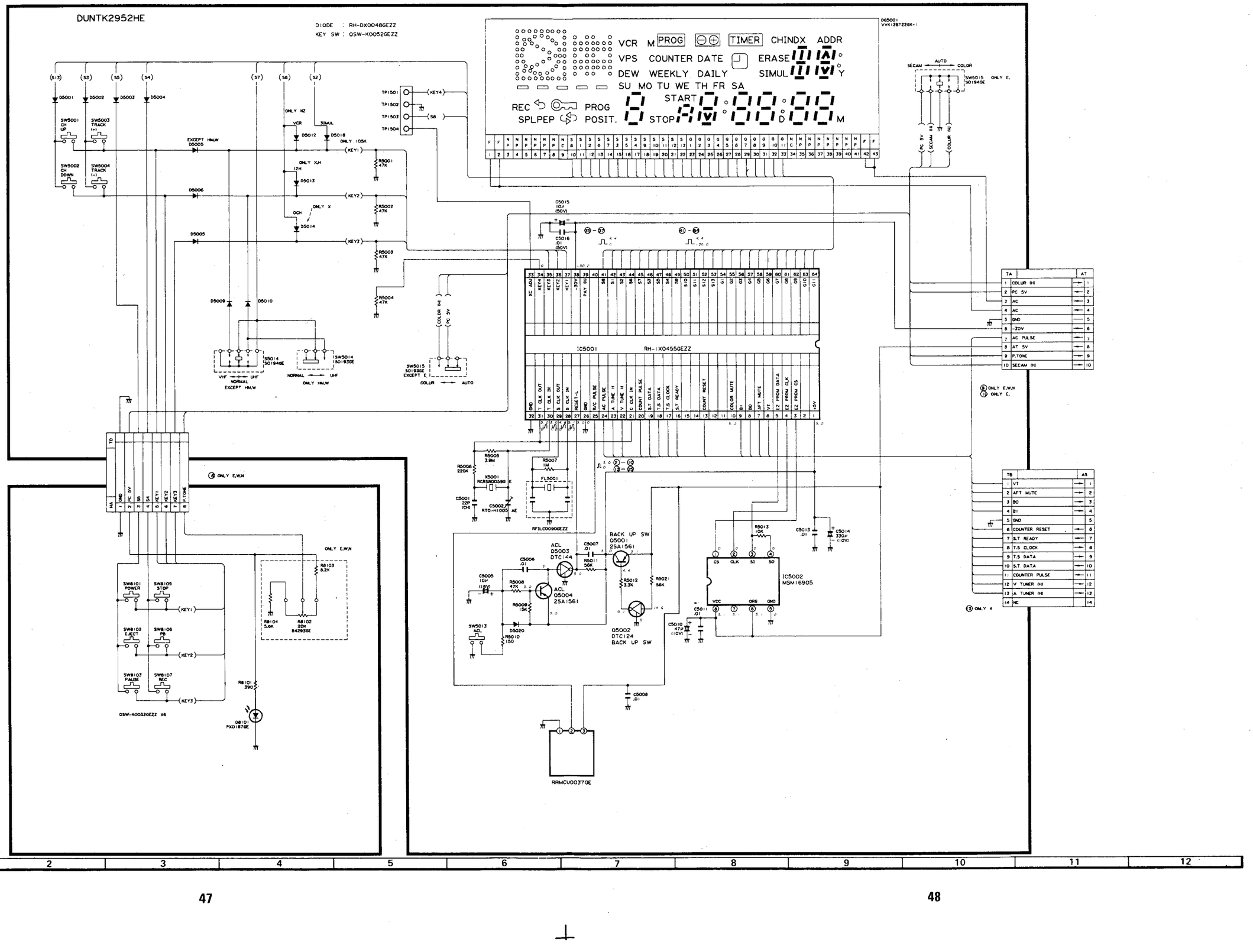
Record Luminance Signal

Record Chrominance Signal

Playback Luminance Signal

Playback Chrominance Signal

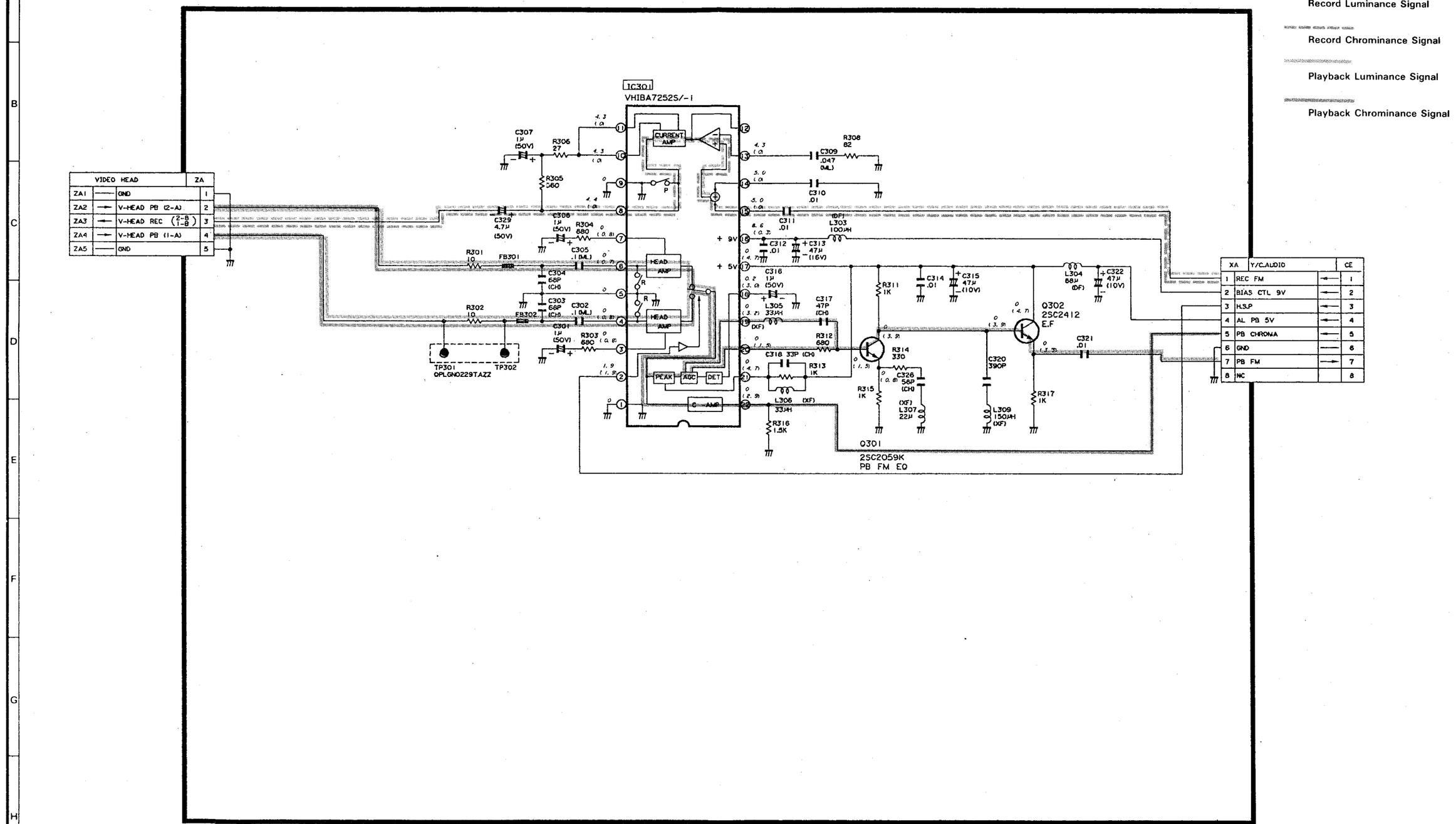
OPERATION CIRCUIT / TIMER CIRCUIT



47

48

HEAD AMPLIFIER CIRCUIT



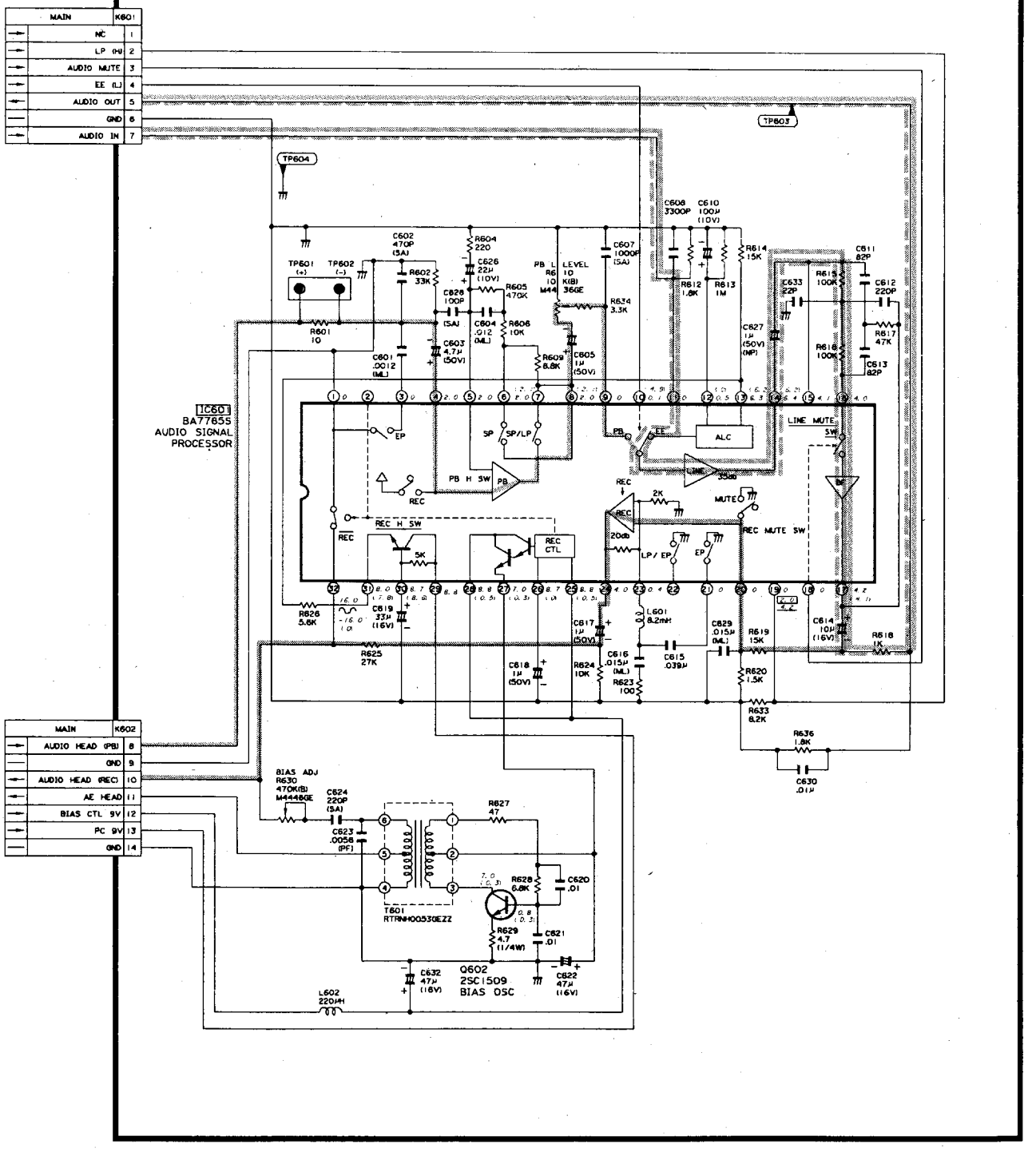
AUDIO CIRCUIT

Audio Playback Signal

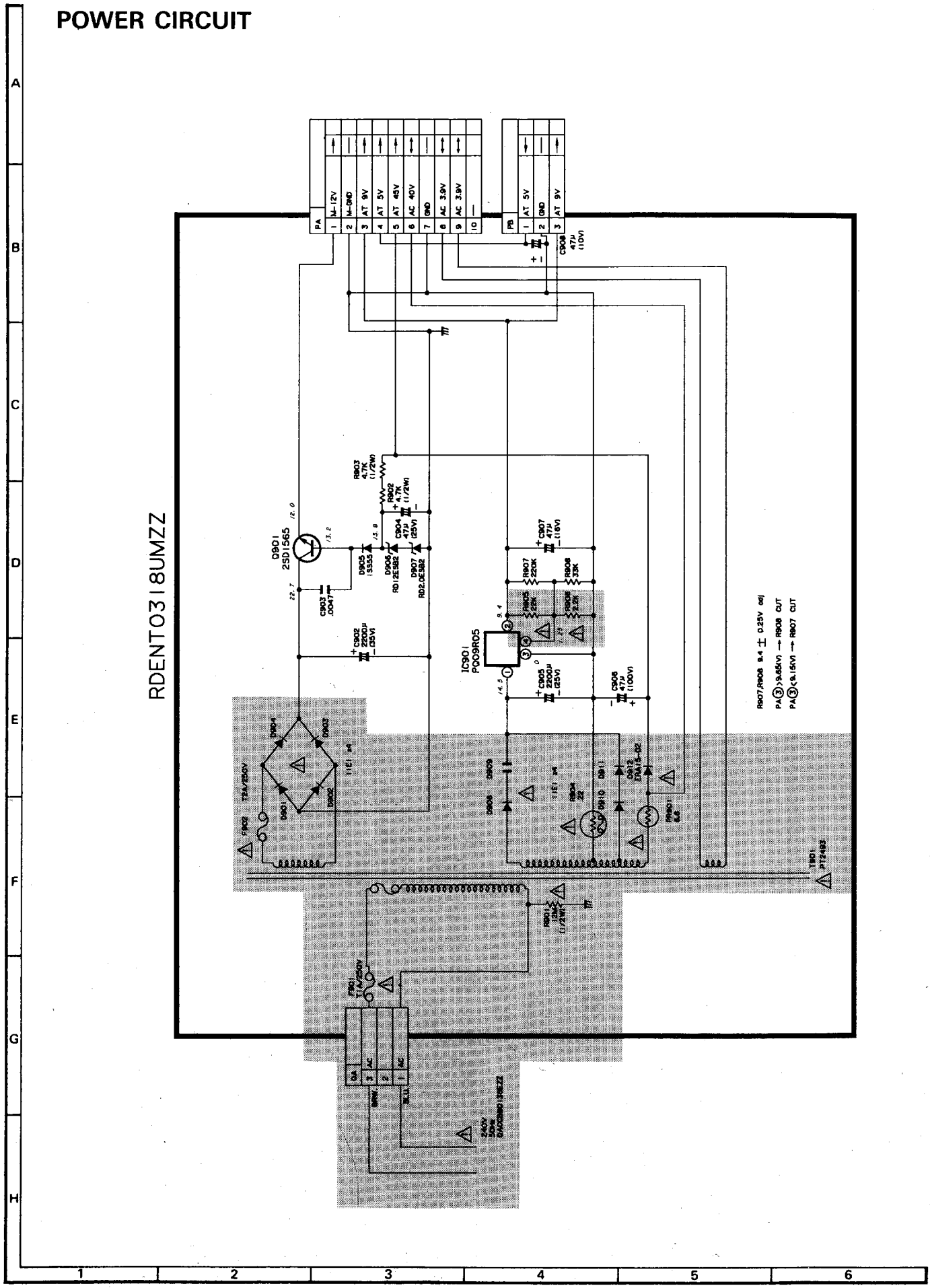
Audio Record Signal

Audio E-E Signal

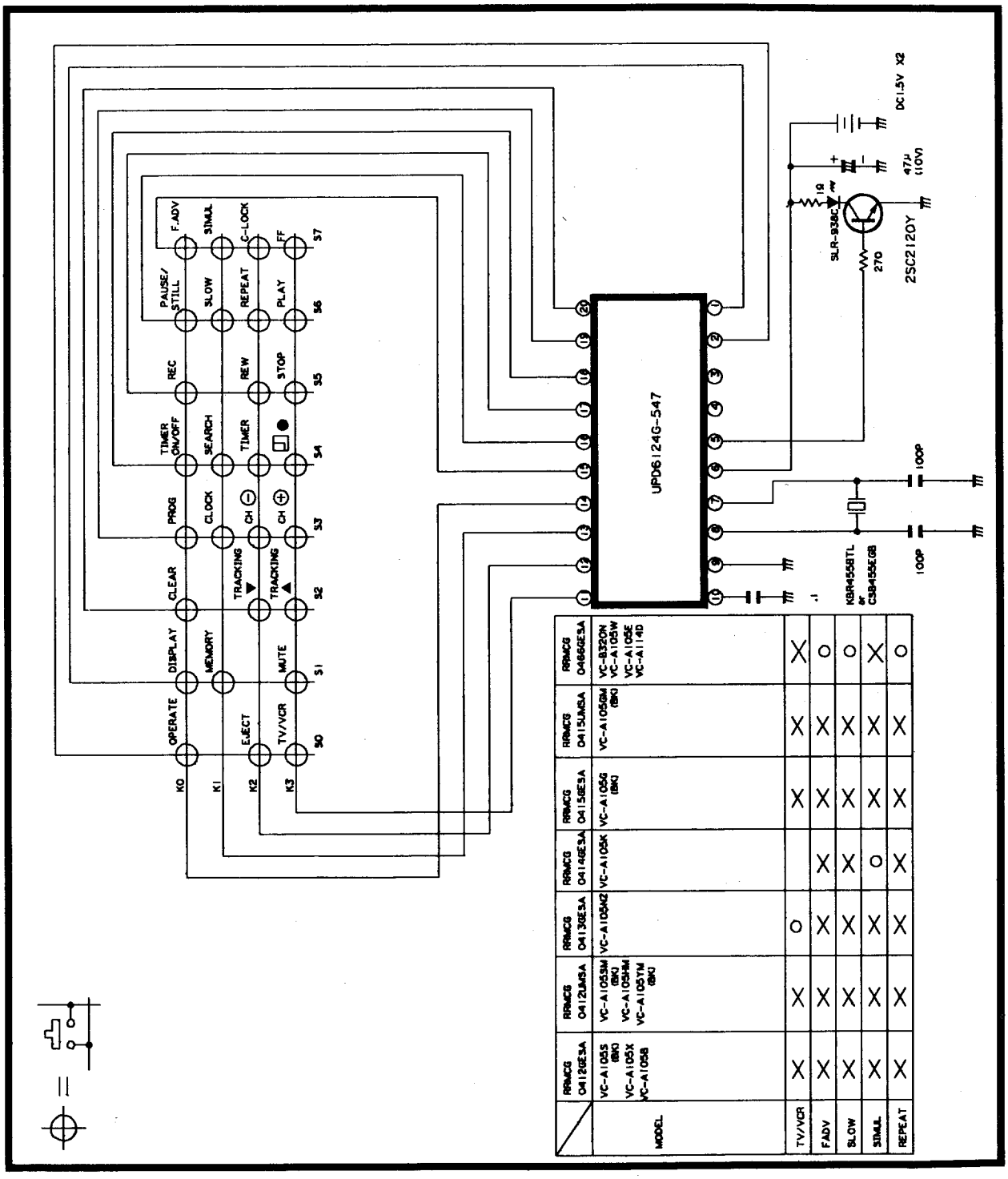
RUNTK0505GEZZ



POWER CIRCUIT

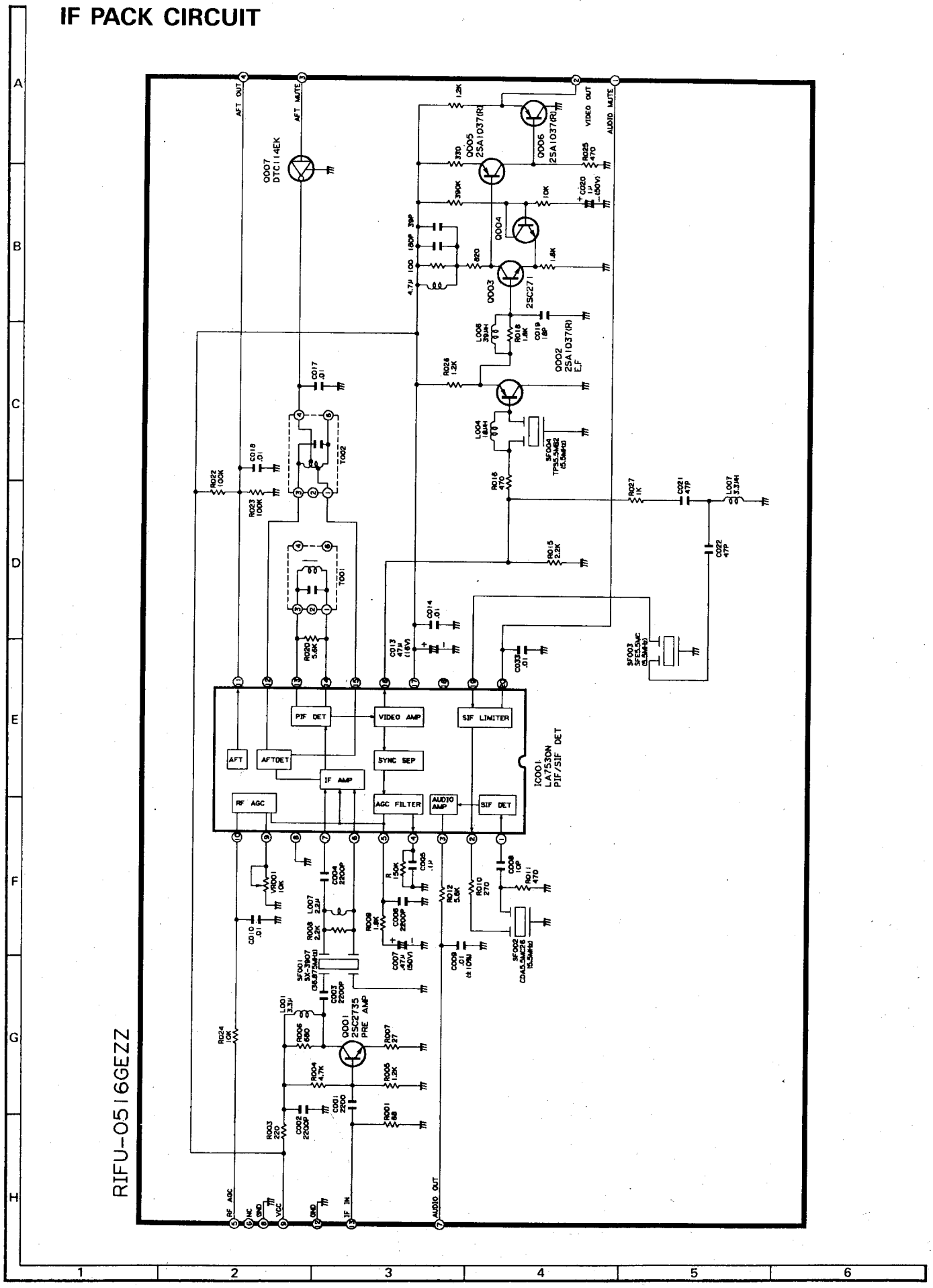


INFRARED REMOTE CONTROL CIRCUIT

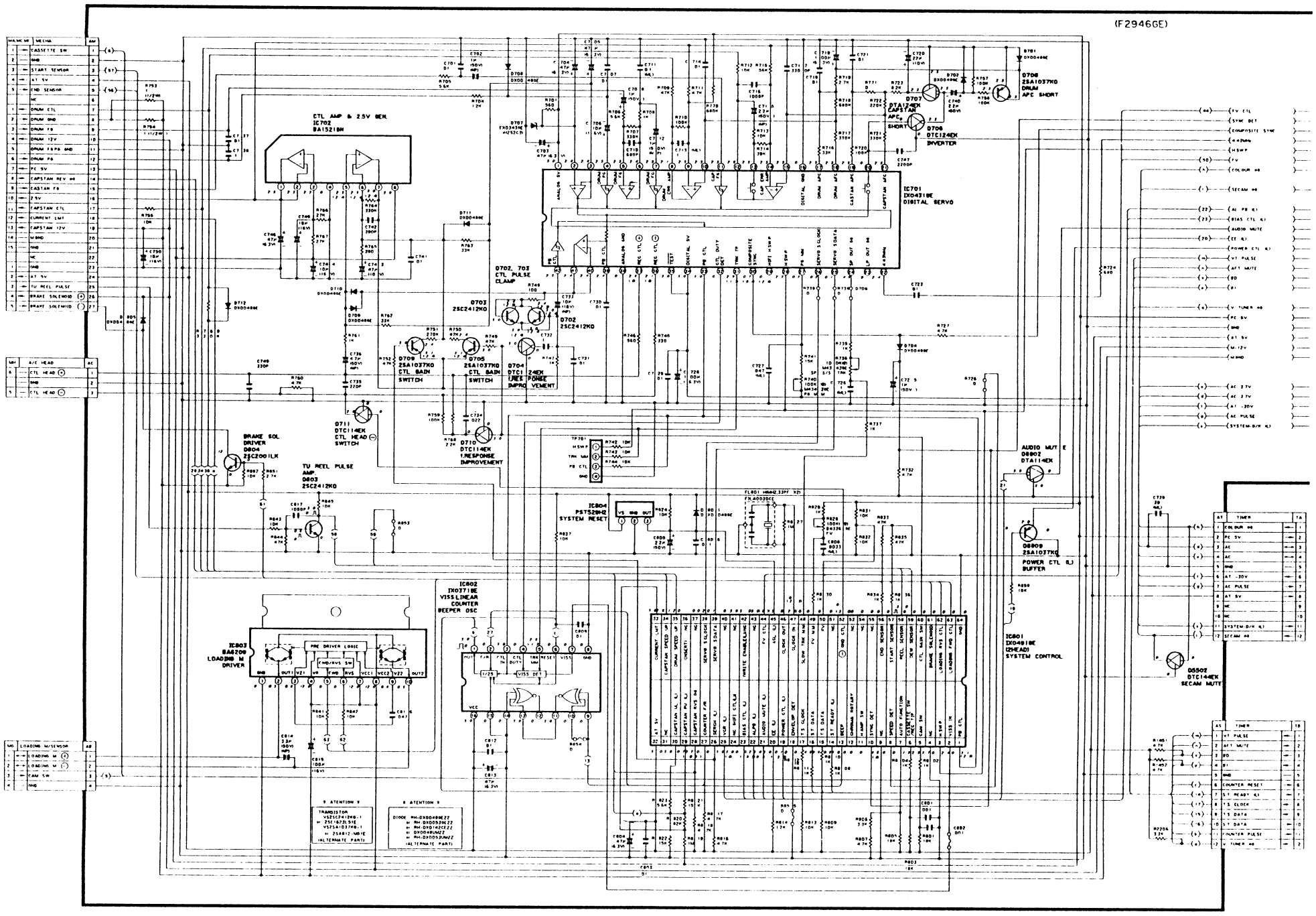


MODEL	RRMCG 0412GE3A	RRMCG 0412UM5A	RRMCG 0413GE3A	RRMCG 0414GE3A	RRMCG 0415E3A	RRMCG 0415UM5A	RRMCG 0466GE3A
	VC-A105S (BK) VC-A105X VC-A105B	VC-A1053M (BK) VC-A1059M VC-A105YM (BK)	VC-A1054M2	VC-A105K	VC-A1054 (BK)	VC-A1056M (BK)	VC-B320N VC-A105W VC-A105E VC-A114D
TV/VCR	X	X	O		X	X	X
F.ADV	X	X	X	X	X	X	O
SLOW	X	X	X	X	X	X	O
SIMUL.	X	X	X	O	X	X	X
REPEAT	X	X	X	X	X	X	O

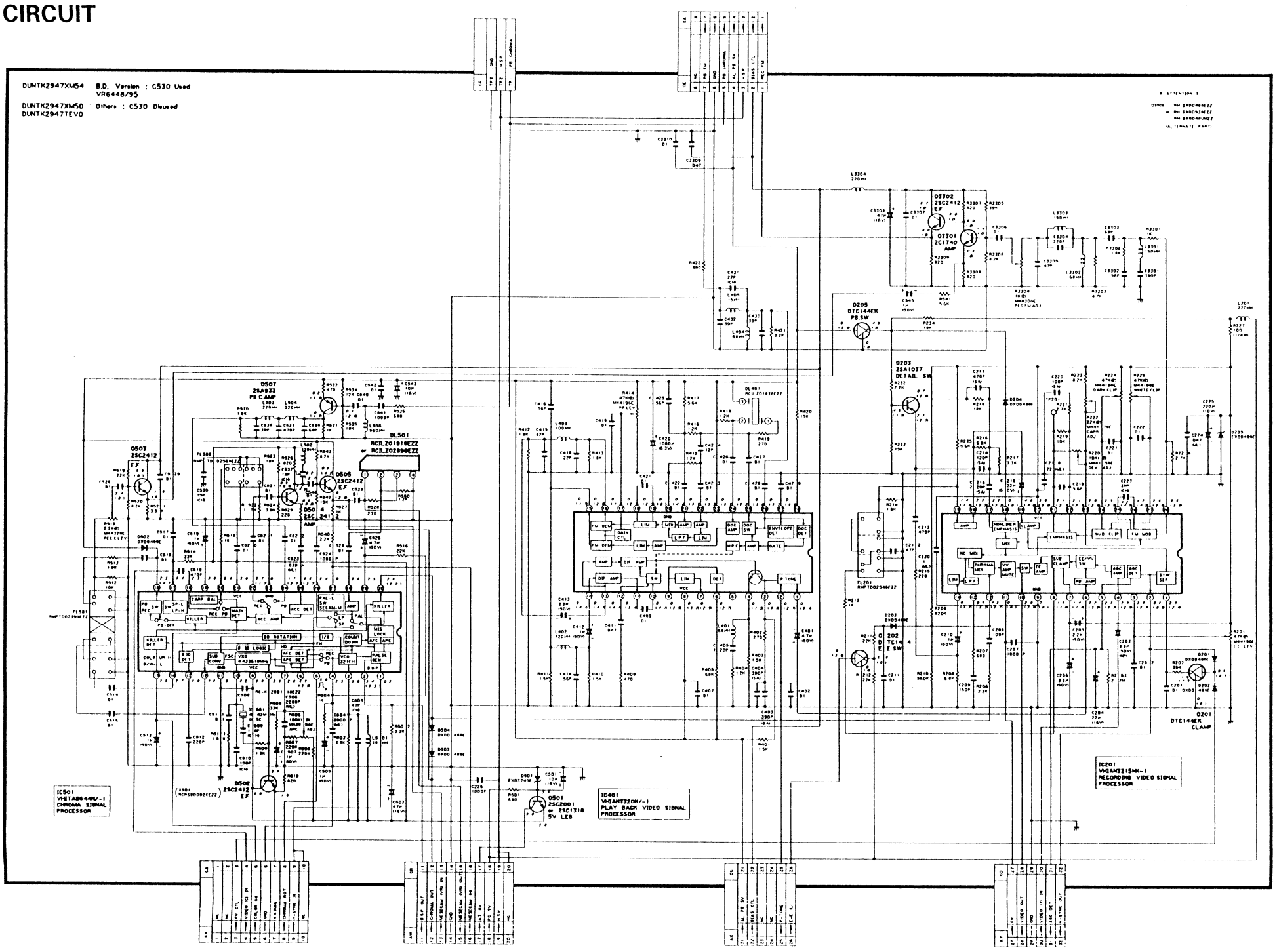
IF PACK CIRCUIT

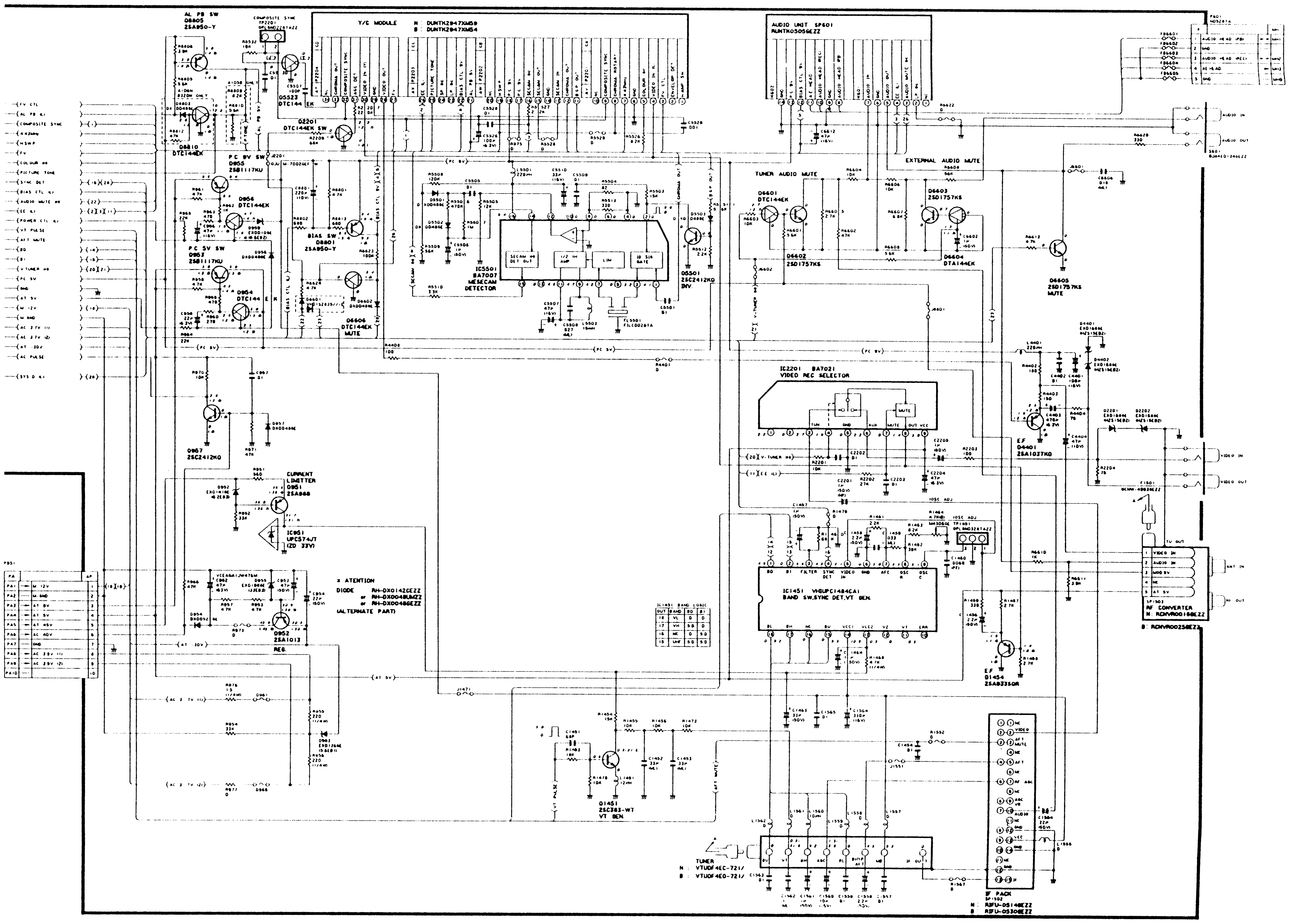


SYSTEM CONTROL, SERVO, IF CIRCUIT

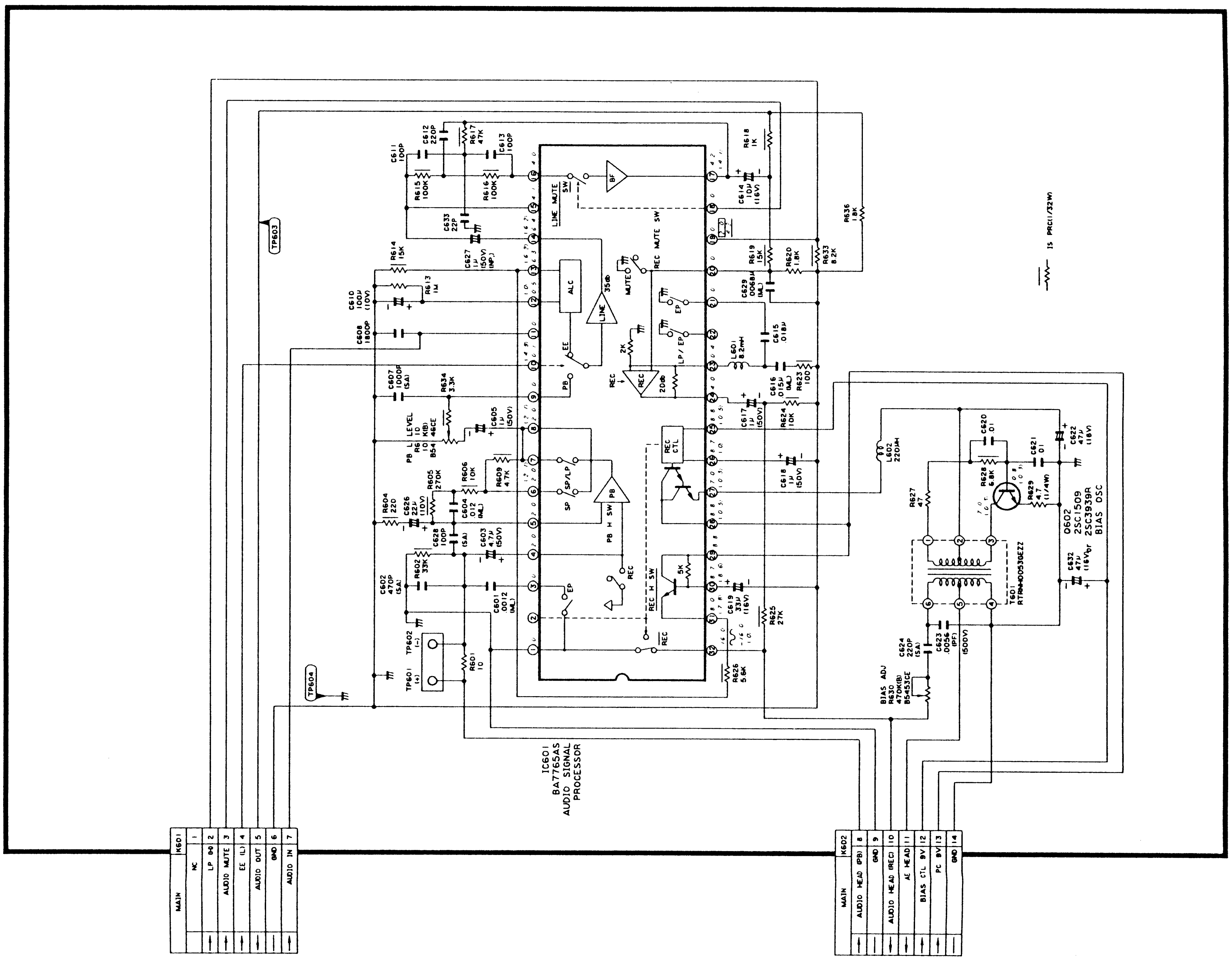

(F2946GE)
IC702 BA15218N
CTL AMP & 2.5V GEN.
IC701 DX0431BE DIGITAL SERVO
0702, 703 CTL PULSE CLAMP
0703 2SC2412K0
0702 2SC2412K0
0704 DTC124EK TAPE ADVANCE IMPROVEMENT
0705 2SA1037K0 CTL GAIN SWITCH
0709 2SA1037K0 CTL GAIN SWITCH
0707 DTA124EK CAPSTAN APC SHORT
0706 DTC124EK INVERTER
0708 2SA1037K0 DRUM APC SHORT
0711 DTC114EK CTL HEAD SWITCH
0710 DTC114EK RESPONSE IMPROVEMENT
BRAKE SOL DRIVER 0804 2SC2001LK
TU REEL PULSE AMP 0803 2SC2412K0
IC804 PST529H2 SYSTEM RESET
IC802 DX0371BE V.I.S.S. LINEAR COUNTER BEEPER OSC
IC803 BA6209 LOADING M DRIVER
IC801 DX0491BE (2HEAD) SYSTEM CONTROL
AUDIO MUTE 0802 DTA114EK
0809 2SA1037K0 POWER CTL (L) BUFFER
0808 DTC144EK SECAM MUTE
A/C HEAD
LOADING M/SENSOR
TRANSISTOR 2SC1623L5HE-1 or 2SA1037K0-1 or 2SA812-M9HE (ALTERNATE PART)
DIODE RH-DX0048WZZ or RH-DX0053WZZ or DX0048UWZZ or RH-DX0053WWZ (ALTERNATE PART)

Y/C CIRCUIT


DUNTK2947XM54 B.D. Version : C530 Used VR6448/95
DUNTK2947XM50 Others : C530 Disused
DUNTK2947TEV0
0507 2SA933 PB C.AMP
0505 2SC2412 EF
0506 2SC2412 AMP
0502 2SC2412 EF
0503 2SC2412 EF
0501 2SC2001 or 2SC1318 5V LED
0302 2SC2412 EF
0301 2C1740 AMP
0205 DTC144EK PB SW
0203 2SA1037 DETAIL SW
0202 DTC144EK E E SW
0201 DTC144EK CLAMP
DL501 RCILZ01810EZZ or RCILZ02990EZZ
IC501 VHETA8644W/-1 CHROMA SIGNAL PROCESSOR
IC401 VHEANT320M/-1 PLAY BACK VIDEO SIGNAL PROCESSOR
IC201 VHEANZ215MK-1 RECORDING VIDEO SIGNAL PROCESSOR


Y/C MODULE
N : DUNTK2947XM59
B : DUNTK2947XM54
AUDIO UNIT SP601
RUNTK0505GEZZ
AL PB SW
Q8805
2SA950-Y
COMPOSITE SYNC
TP2201
Q5523
DTC144 EK
Q2201
DTC144EK SW
Q8810
DTC144EK
P.C 9V SW
Q955
2SB1117KU
Q956
DTC144EK
P.C 5V SW
Q953
2SB1117KU
Q954
DTC144 EK
BIAS SW
Q8801
2SA950-Y
Q6606
DTC144EK
MUTE
IC5501
BA7007
MESECAM
DETECTOR
Q5501
2SC2412KQ
INV.
TUNER AUDIO MUTE
Q6601
DTC144EK
Q6602
2SD1757KS
EXTERNAL AUDIO MUTE
Q6603
2SD1757KS
Q6604
DTA144EK
Q6605
2SD1757KS
MUTE
Q957
2SC2412KQ
CURRENT
LIMITTER
Q951
2SA868
IC951
UPC574JT
(ZD 33V)
x ATENTION
DIODE RH-DX0142CEZZ
or RH-DX0048UMZZ
or RH-DX0048GEZZ
(ALTERNATE PART)
Q952
2SA1013
REG.
IC2201 BA7021
VIDEO REC SELECTOR
E.F
Q4401
2SA1037KQ
IC1451 VHiUPC1484CA1
BAND SW,SYNC DET,VT GEN.
E.F
Q1454
2SA0335OR
Q1451
2SC383-WT
VT GEN.
SP1503
RF CONVERTER
N: RCNVR0016GEZZ
B: RCNVR0025GEZZ
TUNER
N : VTUOF4EC-721/
B : VTUOF4EO-721/
IF PACK
SP1502
N : RIFU-0514GEZZ
B : RIFU-0530GEZZ
AUDIO IN
AUDIO OUT
VIDEO IN
VIDEO OUT
ANT IN
RF OUT

AUDIO CIRCUIT


IC601
BA7765AS
AUDIO SIGNAL
PROCESSOR
Q602
2SC1509
2SC3939R
BIAS OSC
T601
RTRN-0053GEZZ
BIAS ADJ
R630
470K(B)
B5453CE
PB L LEVEL
TP601
TP602
TP603
TP604
IS PRC(1/32W)
K601
MAIN
NC
LP 9V
AUDIO MUTE
EE (L)
AUDIO OUT
GND
AUDIO IN
K602
AUDIO HEAD (PB)
GND
AUDIO HEAD (REC)
AE HEAD
BIAS CTL 9V
PC 9V
GND

★ MARK: SPARE PARTS-DELIVERY SECTION

REPLACEMENT PARTS LIST

PARTS REPLACEMENT

Many electrical and mechanical parts in video cassette recorder have special safety-related characteristics.
These characteristics are often not evident from visual inspection nor can be protection afforded by them necessarily obtained by using replacement components rated for higher voltage, wattage, etc.
Replacement parts which have these special safety characteristics identified in this manual; electrical components having such features are identified by ⚠ in the Replacement Parts Lists.
The use of a substitute replacement part which does not have the same safety characteristics as the factory recommended replacement parts shown in this service manual may create shock, fire or other hazards.

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, please furnish the following informations.

1. MODEL NUMBER
2. REF. NO.
3. PART NO.
4. DESCRIPTION
5. CODE

⚠ MARK: SAFETY RELATED PARTS

PWB ASSEMBLY IS NOT REPLACEMENT ITEM

REF. NO.	PART NO.	★	DESCRIPTION	CODE
MAIN (SERVO, SYSTEM CONTROL, IF) CIRCUIT				
	DUNTK2946TEV1	U	Main (Servo, System-Control, IF) Board Assembly	—
TRANSISTORS				
Q701, 702, 703, 801, 802, 803, 957	VS2SC2412KQ-1 or VS2SC1623L51E		2SC2412KQ 2SC1623	AA AB
Q704, 706	VSDTC124EK/-1		DTC124EK	AB
Q705, 708, 709, 4401, 8809	VS2SA1037KQ-1		2SA1037KQ	AA —
Q707	VSDTA124EK/-1		DTA124EK	AB
Q710, 711	VSDTC114EK/-1		DTC114EK	AB
Q804	VS2SC2001LK-1		2SC2001LK	AA
Q951	VS2SA988//1E		2SA988	AB
Q952	VS2SA1013//1E		2SA1013	AD
Q953, 955	VS2SB1117KU1E		2SB1117KU	AE
Q954, 956, 2201, 6601, 6606, 8808	VSDTA144EK/-1		DTA144EK	AB
Q1451	VS2SC383-WT-1		2SC383-WT	AE
Q6602, 6603, 6605	VS2SD1757KS-1		2SD1757KS	AC
Q6604, 8807	VSDTA144EK/-1		DTA144EK	AC
Q8801, 8805	VS2SA950-Y/1E		2SA950-Y	AD
Q8802	VSDTA114EK/-1		DTA114EK	AB
INTEGRATED CIRCUITS				
IC701	RH-iX0431GEZZ			AS
IC702	VHiBA15218N-1			AD
IC801	RH-iX0491GEZZ			AV
IC802	RH-iX0371GEZZ			AL
IC803	VHiBA6209//1E			AG
IC804	VHiPST529H2-1			AD
IC951	VHiUPC574JT-1			AC
IC2201	VHiBA7021//-1			AE
DIODES				
D701, 702, 703, 704, 708 — 712, 801, 804, 956, 957, 6602, 8802	RH-DX0048GEZZ or RH-DX0048UMZZ	U		AA —
D707	RH-EX0343GEZZ		HZS2C3	AB
D805, 954	RH-DX0052GEZZ			AB
D952	RH-EX0141GEZZ		HZS6.2EB3	AB
D953	RH-EX0152GEZZ		HZS9.1EB1	AA
D955	RH-EX0198GEZZ		HZS33EB3	AB
D959	RH-EX0010GEZZ		RD5.6EB2	AB
D2201, 2202, 4401, 4402	RH-EX0168GEZZ		HZS15EB2	AA
D6601	VHD1S2835//1E			AC
D8801	RH-EX0217CEZZ		RD15E	AB
CONTROLS				
R736, 740	RVR-M4343GEZZ		100k(B) Slow/Still Tracking Adj. 100k(B) Playback Phase Generator MM Adj.	AB
R828	RVR-B4336GEZZ		100k(B) False Vertical Sync. Adj.	AD

REF. NO.	PART NO.	★	DESCRIPTION	CODE
	COILS AND FILTER			
L1451	VP-XF120K0000		12μH	AB
L4401	VP-MK221K0000		220μH	AB
FL801	RFiLA0030CEZZ		Filter	AD
	CAPACITORS			
C702, 712, 814, 2201	VCE9EA1HW105M		1μF, 50V, 20%, Electrolytic (N.P.)	AC
C713, 726, 1562	RC-QZZ104UMYK	U	0.1μF, Mylar	—
C715	VCE9EA1HW225M		2.2μF, 50V, 20%, Electrolytic (N.P.)	AB
C719, 728	VCEAGA0JW107M		100μF, 6.3V, 20%, Electrolytic	AB
C727	RC-QZZ473UMYK	U	0.047μF, Mylar	—
C732, 738	RC-KZ0011GEZZ		0.1μF, Ceramic	AA
C733	VCE9EA1CW106M		10μF, 16V, 20%, Electrolytic	AC
C736	VCE9EA1HW475M		4.7μF, 50V, 20%, Electrolytic (N.P.)	AD
C739	RC-QZZ394UMYK	U	0.39μF, Mylar	—
C743	RC-EZ0123GEZZ		47μF, 10V, Electrolytic	AB
C1452, 1453	RC-QZZ334UMYK	U	0.33μF, Mylar	—
C1564, 4401	VCEAEA1CW107M		100μF, 16V, 20%, Electrolytic	AC
C4403	VCEADA0JW477M		470μF, 6.3V, 20%, Electrolytic	AB
C5526	VCEAEA0JW107M		100μF, 6.3V, 20%, Electrolytic	AB
C8801	VCEAGA1AW227M		220μF, 16V, 20%, Electrolytic	AB
	MISCELLANEOUS			
	RUNTK0505GEZZ		Audio Unit	AW
	RiFU-0516GEZZ		IF Pack	AY
	VTUATEMB1-015		Tuner	AZ
	QPLGN0228TAZZ		Plug, 2 pin (TP2201)	AB
	QPLGN0328TAZZ		Plug, 3 pin (AC)	AD
	QPLGN0428TAZZ		Plug, 4 pin (TP701—704)	AB
	QPLGN0528TAZZ		Plug, 5 pin (AB)	AB
	QPLGN0679GEZZ		Plug, 6 pin (AX, AY)	AB
	QPLGN1079GEZZ		Plug, 10 pin (AW, AV)	AB
	QSōCN0894GEZZ		Socket, 8 pin (AT)	AC
	QSōCN1022REZZ		Socket, 10 pin (AP)	AC
	QSōCN1294GEZZ		Socket, 12 pin (AS)	AC
	QSōCZ2120GEZZ		Socket 21 pin	AE
	QSōCN2794GEZZ		Socket, 27 pin (AM)	AF
	RCNVR0011UMZZ	U	RF Converter	—
	Y/C CIRCUIT			
	DUNTK2947TEV0		Y/C Board Assembly	—

REF. NO.	PART NO.	★	DESCRIPTION	CODE
	TRANSISTORS			
Q201, 205	VSDTC144EK/-1		DTC144EK	AB
Q202	VSDTC144ES/-1		DTC144ES	AB
Q203	VS2SA1037KQ-1		2SA1037KQ	AA
Q501	VS2SC2001LK-1		2SC2001LK	AA
Q502, 503, 504, 505, 3302	VS2SC2412KQ-1		2SC2412KQ	AA
Q507	VS2SA933SQR1E		2SA933SQR	AB
Q3301	VS2C1740SQR1E		2C1740SQR	AC
	INTEGRATED CIRCUITS			
IC201	VHiAN3215NK-1		AN3215NK	AP
IC401	VHiAN3320K/-1		AN3320K	AQ
IC501	VHiTA8644N/-1		TA8644N	AP
	DIODES AND CRYSTAL			
D201, 202, 203, 204, 502, 503, 504	RH-DX0048GEZZ or RH-DX0048UMZZ	U		AA —
D205	RH-EX0049GEZZ		MTZ5.1A	AB
D501	RH-EX0374GEZZ		HZS6A3/TA	AA
X501	RCRSB0002CEZZ		Crystal	AM
	CONTROL			
R201, 224, 225, 414	RVR-M4419GEZZ		47k(B) EE Level Adj. 47k(B) Dark Clip Adj. 47k(B) White Clip Adj. 10k(B) Playback Level Adj.	AB
R220	RVR-M4415GEZZ		10k(B) Deviation Adj.	AB
R222	RVR-M4417GEZZ		10k(B) FM Carrier Adj.	AB
R506	RVR-M4380GEZZ		100k(B) Automatic Phase Control	AC
R518	RVR-M4432GEZZ		2.2k(B) Record Chroma Level Adj.	AB
R3304	RVR-M4430GEZZ		1k(B) Record FM Level Adj.	AB
	COILS AND FILTERS			
L201, 3304	VP-DF221K0000		220μH	AB
L401, 404, 3302	VP-XF680K0000		68μH	AB
L402	VP-XF121K0000		120μH	AB
L403	VP-XF101K0000		100μH	AB
L405	VP-XF150K0000		15μH	AB
L501	VP-XF180K0000		18μH	AB
L502	VP-XF390K0000		39μH	AB
L503, 504	VP-XF221K0000		220μH	AB

REF. NO.	PART NO.	★	DESCRIPTION	CODE
L505	VP-MK561K0000		560μH	AB
L3301, 3303	VP-XF151K0000		150μH	AB
DL401	RCiLZ0183GEZZ		Delay Line	AK
DL501	RCiLZ0191GEZZ		Delay Line	AM
FL201	RMPTD0254GEZZ		Filter	AG
FL501	RMPTD0239GEZZ		Filter	AG
FL502	RMPTD0256GEZZ		Filter	AF
CAPACITORS				
C203	VCE9EA1HW335M		3.3μF, 50V, 20%; Electrolytic (N.P.)	AB
C218	RC-QZZ224UMYK	U	0.22μF, Mylar	—
C224	RC-QZZ473UMYK	U	0.047μF, Mylar	—
C225	VCEAGA1AW227M		220μF, 10V, 20%, Electrolytic	AB
C230	RC-QZZ104UMYK	U	0.1μF, Mylar	AA
C420	VCEAGA0JW108M		1000μF, 6.3V, 20%, Electrolytic	AC
C504	RC-QZA392TAYJ		3900pF, Mylar	AB
C506	RC-QZA222TAYJ		2200pF, Mylar	AB
C508	RC-KZ0011GEZZ		0.1μF, Ceramic	AA
C523	RC-QZZ393UMYK	U	0.039μF, Mylar	—
MISCELLANEOUS				
	QPLGN0329TAZZ		Plug, 3 pin (CF)	AB
	QPLGN0878GEZZ		Plug, 8 pin (CE)	AC
	QSõCN0679GEZZ		Socket, 6 pin (CC, CD)	AC
	QSõCN1079GEZZ		Socket, 10 pin (CA, CB)	AC
OPERATION CIRCUIT				
	DUNTK2951TEV0		Operation Board Assembly	—
DIODE				
D8101	RH-PX0167GEZZ		LED	AB
MISCELLANEOUS				
SW8101, 8102, 8103, 8105, 8106, 8107	QSW-K0052GEZZ		Switch, Power Switch, Eject Switch, Pause Switch, Stop Switch, Playback Switch, Record	AB
TIMER CIRCUIT				
	DUNTK2952TEV1		Timer Board Assembly	—
TRANSISTORS				
Q5001, 5004	VS2SA1561Q/1E		2SA1561	AC

REF. NO.	PART NO.	★	DESCRIPTION	CODE
Q5002	VSDTC124ELT-1		DTC124ELT	AA
Q5003	VSDTC144ELT-1		DTC124ELT	AB
INTEGRATED CIRCUITS				
IC5001	RH-iX0455GEZZ			AX
IC5002	VHiMSM16905-1		MSM16905	AL
DIODES AND CRYSTAL				
D5001 | 5004, 5013, 5020	RH-DX0048GEZZ or RH-DX0048UMZZ	U		AA —
X5001	RCRSB0059GEZZ		Crystal	AD
FILTER				
FL5001	RFiLC0090GEZZ		Filter	AD
CAPACITOR				
C5014	VCEADA1AW337M		330μF, 10V, 20%, Electrolytic	AB
TRIMMER				
C5002	RTõ-H1005AEZZ		Oscillation Adj.	AC
MISCELLANEOUS				
	VVK12BT22GK-1		Display Tube	AX
	RRMCU0037GEZZ		Infrared Remote Control Receiver	AL
	QPLGN0428TAZZ		Plug, 4 pin (TP1501 1504)	AB
	QPLGZ0723GEZZ		Plug, 7 pin (TD)	AC
	QSõCN0895GEZZ		Socket, 8 pin (TA)	AC
	QSõCN1295GEZZ		Socket, 12 pin (TB)	AC
SW5001, 5002, 5003, 5004, 5013	QSW-K0052GEZZ		Switch, Channel Up Switch, Channel Down Switch, Tracking (+) Switch, Tracking (−) Switch, All Clear	AB
SW5014	QSW-S0193GEZZ		Switch, VHF/UHF	AC
SW5015	QSW-S0193GEZZ		Switch, Colour/Auto	AC
HEAD AMP. CIRCUIT				
	DUNTK2948TEV0		Head Amp. Board Assembly	
TRANSISTORS				
Q301	VS2SC2059KN1E		2SC2059K	AC
Q302	VS2SC2412KQ-1		2SC2412	AA

REF. NO.	PART NO.	★	DESCRIPTION	CODE
INTEGRATED CIRCUIT				
IC301	VHi BA7252S/ - 1			AM
COILS				
L303	VP - DF101K0000		100μH	AB
L304	VP - XF680K0000		68μH	AB
L305, 306	VP - XF330K0000		33μH	AB
L307	VP - XF220K0000		22μH	AB
L309	VP - XF151K0000		150μH	AB
CAPACITORS				
C302, 305	RC - QZZ104UMYK	U	0.1μF, Mylar	—
C309	RC - QZZ473UMYK	U	0.047μF, Mylar	—
MISCELLANEOUS				
	QPLGN0229TAZZ		Plug, 2 pin (TP301, 302)	AB
	QPLGN0880GEZZ		Plug, 8 pin (XA)	AC
	QSōCN0532REZZ		Socket, 5 pin (ZA)	AB
FB301, 302	RBLN - 0013GEZZ		Ferrite Bead	AB
AUDIO CIRCUIT				
	RUNTK0505GEZZ		Audio Board Assembly	AW
TRANSISTOR				
Q602	VS2SC3939R1 - 1		2SC3939R	AD
	or			
	VS2SC1812Q/ - 1		2SD1812Q	AC
INTEGRATED CIRCUIT				
IC601	VHi BA7765S/ - 1		BA7765S	AL
	or			
	VHi BA7765AS/ /		BA7765AS	AM
CONTROLS				
R610	RVR - B5446CEZZ		10k(B) Playback Level Adj.	AB
R630	RVR - B5453CEZZ		470k(B) Bias Adj.	AB
COILS AND TRANSFORMER				
L601	VP - YF822J0000		8.2mH	AC
	or			
	VP - ZF822J0000		8.2mH	AC
L602	VP - ZK221K0000		220μH	AB
T601	RTRNH0053GEZZ		Oscillator	AE

REF. NO.	PART NO.	★	DESCRIPTION	CODE
CAPACITORS				
C610	VCEAAA1AW107M		100μF, 10V, 20%, Electrolytic	AB
C623	VCQPSA2HA562J		.0056μF, 500V, Polypro Film	AB
MISCELLANEOUS				
	QPLGN0229TAZZ		Plug, 2 pin (TP601, 602)	AB
	QPLGZ0725GEZZ		Plug, 7 pin (K601, 602)	AC
POWER CIRCUIT				
	RDENT0318UMZZ	U	Power Board Assembly	—
TRANSISTOR				
Q901	95KUAD0088AZ		2SD1565	AF
INTEGRATED CIRCUIT				
IC901	95KUCB0029AZ		PQ09R05	AK
DIODES				
⚠D901, ⚠902, ⚠903, ⚠904, ⚠908, ⚠909, ⚠910, ⚠911	95KUBC0112AZ		11E1	AB
D905	95KUBA0005AZ		1SS55	AB
D906	95KUBD0439CZ		RD12ESB2	AB
D907	95KUBD0455CZ		RD2.0ESB2	AB
D912	95KUBC0125BZ		ERA15-02	AB
TRANSFORMER				
⚠T901	95K116035026	U	PT2493UK	—
CAPACITORS				
C902, 905	95KUGZ0654ZZ		2200μF, 35V, Electrolytic	AG
C906	95KUGAJ470BU		47μF, 100V, Electrolytic	AD
RESISTORS				
⚠R901	95KUEZ0085ZZ		12M ohm, 1/2W, Solid	AE
⚠R904	95KUEBBR22AG		0.22 ohm, Fusible Resistor	AC
⚠R905	95KUES2202AA		22k ohm, 1/4W, Carbon	AA
⚠R906	95KUES2201AA		2.2k ohm, 1/4W, Carbon	AA
⚠PR901	95KUEZ0389ZZ		6.8 ohm, Thermistor	AE

REF. NO.	PART NO.	★	DESCRIPTION	CODE
MISCELLANEOUS				
⚠	QACCB9013GEZZ		AC Cord, AC220V/50Hz	AL
⚠F901	95KPJC472ZZ		Fuse, T1A, 250V	AD
	or			
⚠	95KPJC376ZZ		Fuse, T1A, 250V	AE
⚠F902	95KPJC0473ZZ		Fuse, T2A, 250V	AD
	or			
⚠	95KPJC0237ZZ		Fuse, T2A, 250V	AE
OA	95KPKZ0194ZZ		Plug, 3 pin	AC
THE OTHER PARTS				
	QCNW-3741UMZZ	U	Connecting, Cord	—
	TINS-1177UMZZ	U	Operation Manual	—
	TGAN-A037WRRO	U	Guarantee Card	—
	UBATU0007UMZZ	U	Dry Battery	—
INFRARED REMOTE CONTROL CIRCUIT				
	RRMCG0412UMSA	U	Infrared Remote Control Unit	—
TRANSISTOR				
	92P3SN00059T	U	2SC4040	—

REF. NO.	PART NO.	★	DESCRIPTION	CODE
INTEGRATED CIRCUIT				
	92P3SQ00136	U	UPD6124-547	—
DIODE AND FILTER				
	92P3QH00005G	U	LED	
	92P3EF00002	U	Ceramic Filter	—
MISCELLANEOUS				
	92P3ETFA0801	U	Battery Terminal A	—
	92P3ETFA1001	U	Battery Terminal C	
CABINET PARTS				
	92PFA11C9601	U	Cabinet-A	—
	92PFA11C9701	U	Cabinet-B	—
	92PFA11B8801	U	Cabinet-C	
	92PFA42B4821	U	Rubber Key	—
	92PFA58A3403	U	Infrared Filter	—
	92PFA62B1686	U	Indication Plate	—
	92P2A502120	U	Screw	

MECHANISM CHASSIS PARTS

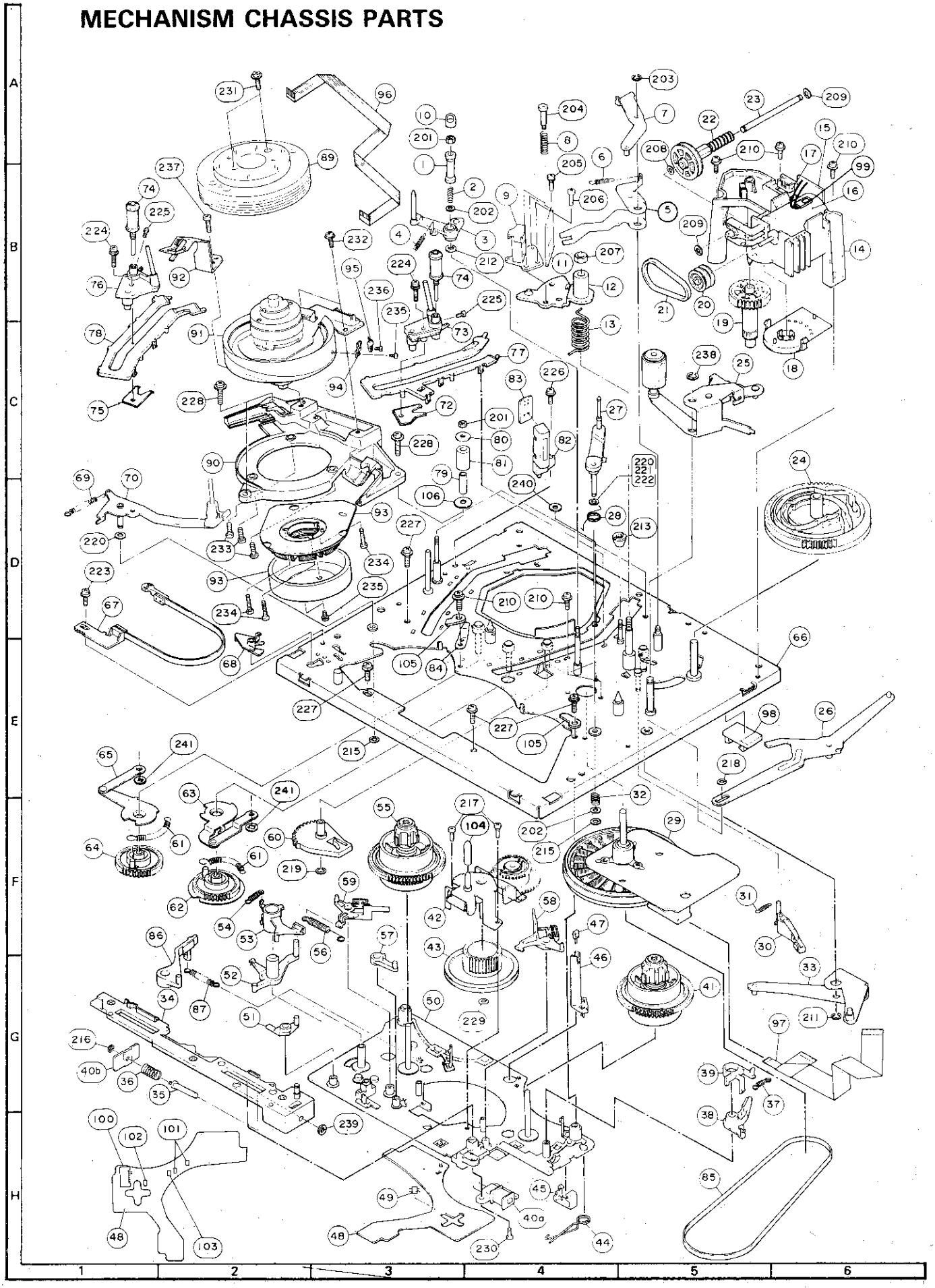
REF. NO.	PART NO.	★	DESCRIPTION	CODE
1	PGi DS0023GEFW		Retaining Guide	AR
2	MSPRC0142GEFJ		Retaining Guide Spring	AA
3	MLEVC0022GEZZ		Half-Loading Lever	AF
4	MSPRT0270GEFJ		Half-Loading Lever Spring	AA
5	MLEVF0284GEFW		Half-Loading Drive Lever	AC
6	MSPRT0269GEFJ		Half-Loading Reciprocating Spring	AA
7	MLEVF0283GEZZ		Half-Loading Reciprocating Lever	AB
8	MSPRC0144GEFJ		Azimuth Spring	AA
9	RHEDU0070GEZZ		Audio/Control Head Ass'y	AS
10	PCAPS1015GEZZ		Retaining Guide Cap	AA
11	QPWBF2888GEZZ		Audio/Control Head PWB	AB
12	MLEVF0292GEZZ		Audio/Control Head Arm	AD
13	MSPRD0087GEFJ		Audio/Control Head Arm Spring	AA
14	LHLDZ1606GEZZ		Loading Block Holder Ass'y	AC
15	QPRBF2886GEZZ		Loading Block PWB	AD
16	RMōTM1049GEZZ		Loading Motor	AM
17	QPLGN0529TAZZ		Plug, 5 pin (MG)	AB
18	QSW-R0023GEZZ		Cam Switch	AF
19	NGERW1032GEZZ		Worm Wheel	AC
20	NPLYV0133GEZZ		Loading Motor Pulley	AC
21	NBLTK0058GE00		Loading Belt	AA
22	NGERW1031GEZZ		Worm Ass'y	AC
23	NSFTG0045GEFJ		Worm Shaft	AB
24	NGERH1118GEZZ		Master Cam	AC
25	MLEVF0281GEZZ		Pinch Roller Lever Ass'y	AN
26	MLEVF0290GEZZ		Relay Shifter Lever	AE
27	MLEVC0023GEZZ		Reverse Guide	AG
28	MSPRD0086GEFJ		Reverse Guide Spring	AA
29	RMōTN2019GEZZ		Capstan D.D. Motor	AZ
30	MLEVP0136GEZZ		Slow Brake Lever	AA
31	MSPRT0276GEFJ		Slow Brake Spring	AA
32	MSPRC0151GEFJ		Reverse Guide Spring	AA
33	MLEVF0289GEZZ		Relay Gear Drive Lever	AE
34	MSLiF0043GEZZ		Brake Shifter	AK
35	NSFTZ0068GEFD		Brake Lock Shaft	AC
36	MSPRC0143GEFJ		Absorber Plate Spring	AB
37	MSPRT0274GEFJ		Video Search Spring	AB
38	MLEVP0130GEZZ		Video Search Brake Lever	AD
39	MLEVP0131GEZZ		Video Search Reciprocating Lever	AC
40	RPLU-0083GEZZ		Brake Solenoid Ass'y	AF
41	NDAiV1046GEZZ		Take-Up Reel Disk Ass'y	AG
42	NGERH1122GEZZ		Idler Gear Ass'y	AN
43	NPLYV0134GEZZ		Reel Pulley	AC
44	MSPRD0085GEFJ		Shifter Spring	AB
45	PCōVP1018GEZZ		Shifter Spring Cover	AC
46	LHLDP1092GEZZ		Cassette LED Holder	AE
47	RH-PX0169GEZZ		Cassette LED	AD
48	QPWBF2977GEZZ		Reel Sensor PWB	AK
49	RH-PX0171GEZZ		Reel Sensor	AE
50	LCHSS0016GEZZ		Reel Block Chassis	AL
51	MLEVP0134GEZZ		Tension Adjusting Lever	AC
52	MLEVP0133GEZZ		Tension Release Lever	AC
53	MLEVP0132GEZZ		Back Tension Lever	AC
54	MSPRT0273GEFJ		Spring, Fast-forward	AB
55	NDAiV1047GEZZ		Supply Reel Disk Ass'y	AH
56	MSPRT0272GEFJ		Main Brake Spring	AC
57	MLEVP0135GEZZ		Intermediate Lever	AC
58	MLEVP0129GEZZ		Main Take-Up Brake Lever	AE
59	MLEVP0128GEZZ		Main Supply Brake Lever	AE
60	NGERH1121GEZZ		Loading Relay Gear	AA
61	MSPRT0271GEFJ		Loading Reciprocating Spring	AA
62	NGERH1120GEZZ		Take-Up Loading Gear	AA
63	MLEVF0286GEZZ		Take-Up Loading Arm Ass'y	AC
64	NGERH1119GEZZ		Supply Loading Gear	AA
65	MLEVF0285GEZZ		Supply Loading Arm Ass'y	AC
66	LCHSM0091GEZZ		Main Chassis Ass'y	AR
67	LBNDK1002GEZZ		Tension Band Ass'y	AD
68	LHLDZ1607GEZZ		Tension Spring Hook Plate	AA
69	MSPRT0275GEFJ		Tension Spring	AA
70	MLEVF0291GEZZ		Tension Arm Ass'y	AF
72	MSLiF0042GEFW		Take-Up Pole Base Slider	AB
73	LPōLM0033GEZZ		Take-Up Pole Base Ass'y	AG
74	NRōLP0062GEZZ		Guide Roller Ass'y	AE
75	MSLiF0041GEFW		Supply Pole Base Slider	AB
76	LPōLM0032GEZZ		Supply Pole Base Ass'y	AG
77	PGi DM0066GEZZ		Take-Up Loading Rail	AB
78	PGi DM0067GEZZ		Supply Loading Rail	AB
79	NSFTL0563GEFW		Supply Impedance Roller inner	AC
80	PGi DH0031GEFW		Supply Impedance Roller Flange	AA
81	NRōLP0056GEZZ		Supply Impedance Roller	AD
82	RHEDT0026GEZZ		Full Erase Head Ass'y	AK
83	QPWBF2936GEZZ		Full Erase Head PWB	AA
84	MSPRP0114GEFJ		Cassette Control Earth Spring	AA
85	NBLTK0059GE00		Reel Belt	AB
86	MLEVP0146GEZZ		Auxiliary Fast-Forward Brake Lever	AE
87	MSPRT0282GEFJ		Auxiliary Fast-Forward Brake Spring	AB
89	DDRMU0002HE17		Upper Drum Ass'y	BQ
90	PGi DC0039GEFW		Drum Base	AL
91	DDRML0012HE01		Lower Drum Ass'y	BB
92	QBRSK0021GEZZ		Earth Brush Ass'y	AC
93	RMōTP1096GEZZ		Drum D.D. Motor Ass'y	AW
94	LANGT9105GEFW		Heater Angle	AC
95	VHiM5F7805L-1		3-terminal Regulator	AE
96	QCNW-4880GEZZ		Full Flat Cable (Drum D.D. Motor)	AN
97	QCNW-5313GEZZ		Full Flat Cable (Capstan D.D. Motor)	AN
98	LHLDW1109GEZZ		Full Flat Cable Holder	AB
99	RDTCH0018GEZZ		Dew Sensor	AG
100	QSōCN0534REZZ		Socket, 5 pin (MF)	AB
101	VRS-TW2ED221J		220 ohm, 1/4W, 5%, Oxide Film	AA
102	VCKYTV1HB102K		0.001μF, 50V, 10%, Ceramic	AA
103	VRS-TV1JD473J		47k ohm, 1/16W, 5%, Oxide Film	AA
104	PCAPS8001GEZZ		Release Pin Cap	AA
105	LANGA0051GEFW		Take-Up Reel Disk Catch Holder	AB
106	PGi DH0036GEFW		Supply Impedance Roller Flange L	AA

REF. NO.	PART NO.	★	DESCRIPTION	CODE
CASSETTE HOUSING CONTROL PARTS				
	CHLDX3045GE99		Cassette Housing Control Assembly (Excludes the Cassette Cover)	BA
301	HDECQ0546GESA		Cassette Cover	AF
302	PGi DM0069GE00		Down Guide	AC
303	QSW-F0034GEZZ		Cassette Erase Protection Switch	AC
304	LHLDX1008GE00		Cassette Housing Frame (Right)	AF
305	MARMP0038GE00		Cassette Cover Arm	AA
306	NGERW1036GEZZ		Phase Gear	AA
307	MSPRD0088GEFJ		Drive Gear Spring (Right)	AA
308	NGERW1034GEZZ		Drive Gear (Right)	AB
309	MSPRT0277GEFJ		Reciprocating Spring	AA
310	NGERW1033GEZZ		Worm Wheel Gear	AB
311	MLEVP0142GE00		Open Lever	AA
312	MSPRD0091GEFJ		Open Lever Spring	AA
313	MLEVP0141GEZZ		Switching Lever	AA
314	MSPRT0280GEFJ		Switching Lever Spring	AA
315	QSW-F0035GEZZ		Cassette Switch	AD
316	LANGF9355GEFW		Worm Bracket	AB
317	NBRGP0013GEZZ		Bearing	AA
318	NSFTD0016GEZZ		Worm Shaft Ass'y	AE
319	MLEVP0140GEZZ		Clutch Lock Lever	AA
320	MSPRT0279GEFJ		Clutch Lock Lever Spring	AA
321	MLEVP0139GEZZ		Clutch Release Lever	AA
322	MSPRD0092GEFJ		Clutch Release Lever Spring	AA
323	MLEVP0138GEZZ		Clutch Lever	AA
324	NPLYV0135GEZZ		Pulley	AA
325	NBLTK0060GE00		Cassette Loading Belt	AB
326	LANGF9354GEFW		Upper Plate	AD
327	LHLDX1011GE00		Slider Holder (Left)	AB
328	MSPRP0115GEFJ		Cassette Spring	AB
329	LANGF9357GEFW		Slider Lock (Left)	AA
330	MSPRT0281GEFJ		Slider Lock Spring	AA
331	MSLiF0044GEFW		Slider	AF
332	MLEVP0137GE00		Lock Release Lever	AA
333	MSPRD0093GEFJ		Lock Release Lever Spring	AA
334	MLEVP0143GE00		Slider Lock Cover	AA
335	LANGF9356GEFW		Slider Lock (Right)	AA
336	LHLDX1010GE00		Slider Holder (Right)	AB
337	NGERW1035GEZZ		Drive Gear (Left)	AB
338	MSPRD0089GEFJ		Drive Gear Spring (Left)	AA
339	LHLDX1009GE00		Cassette Housing Frame (Left)	AF
340	NSFTD0015GEFD		Main Shaft	AD
341	MSPRD0090GEFJ		Cassette Cover Spring	AA
342	QPWBF2893GEZZ		Start Sensor PWB	AC
343	QPWBF2894GEZZ		End Sensor PWB	AB
344	RH-PX0053GEZZ		Phototransistor	AF
345	VS2SA937-Q/-1		Transistor	AC
346	QSõCN0595GEZZ		Socket, 5 pin	AB
347	VRD-RA2EE153J		15k ohm, 1/4W, 5%, Carbon	AA
348	VRD-RA2EE223J		22k ohm, 1/4W, 5%, Carbon	AA
349	VRD-RA2BE332J		3.3k ohm, 1/8W, 5%, Carbon	AA
350	VRD-RA2BE472J		4.7k ohm, 1/8W, 5%, Carbon	AA
351	VRD-RA2BE103J		10k ohm, 1/8W, 5%, Carbon	AA
352	VCTYPA1EX473M		.047μF, 25V, 20%, Ceramic	AA
401	LX-WZ1020GE00		Cut Washer (4.2W-6.0-0.5)	AA
402	LX-HZ3046GEFD		Screw	AA
SCREWS, NUTS, WASHERS AND WIRE CLAMP				
201	LX-NZ3039GEZZ		Adjusting Nut	AA
202	XWHSD26-05060		Washer W2.6S-6-0.5	AA
203	XRESJ20-04000		E Ring-2	AA
204	LX-BZ3095GEFD		AC Head Screw	AA
205	XBPSD26P06000		Azimuth Adjusting Screw	AA
206	LX-BZ3096GEFD		Tilt Adjusting Screw	AA
207	XNFSD40-31000		Adjusting Nut (A/C Head)	AB
208	XWHJZ31-05054		Washer W3.1-5.4-0.5	AA
209	LX WZ1041GE00		Washer W2.6-6-0.5 (LM)	AA
210	XHPSD26P06WSO		Screw C2.6P+6S	AA
211	LX-RZ3001AEZZ		E Ring-3	AA
212	XWHJZ45-02060		Washer PSW4.6-6-0.25	AA
213	LX-NZ4043GEFW		Adjusting Nut	AB
215	LX-WZ1003GE00		Washer CW2.1-5-0.5	AA
216	XRESJ12-03000		E Ring-1.2	AA
217	XBPSD26P03000		Screw 2.6P+3S	AA
218	LX-WZ1006GE00		Washer CW2.5-5.4-0.5	AA
219	XRESJ25-04000		E Ring-2.5	AA
220	XWHJZ25-05050		Washer W2.6-5-0.5	AA
221	XWHJZ25-01050		Washer W2.6-5-0.13	AA
222	XWHJZ25-02050		Washer W2.6-5-0.25	AA
223	LX-HZ3043GEZZ		Screw W2.6+6S	AA
224	LX-BZ3099GEZZ		Screw WSW2P+11S (W5)	AB
225	LX-XZ3030GEFD		Screw M2x4	AC
226	XHPSD26P08WSO		Screw C2.6P+8S	AA
227	XJBSD26P08WSO		B Tight Screw C2.6P+8S	AA
228	XHPSD30P08WSO		Screw C3P+8S	AA
229	LX-WZ1040GE00		Washer CW2.5-6-0.5	AA
230	XJBSD20P06000		B Tight Screw 2P+6S	AA
231	LX-BZ3039GEFW		Screw W3P+9S-Ni	AA
232	LX-HZ3045GEFD		Screw S3P+8S-6W	AA
233	LX-BZ3064GEFN		Screw SW3P+6S-Ni	AA
234	XBPSD26P12J00		Screw SW2.6P+12S	AA
235	XBPSD30P05J00		Screw SW3P+5S	AA
236	XBPSD30P06J00		Screw S3P+6S	AA
237	XHPSD30P08000		Screw S3P+8S	AA
238	LX-RZ3001AEZZ		E Ring (Curl)	AA
239	LX-WZ1042GE00		Washer CW2.7-7-0.5	AA
240	XWHJZ31-02054		Washer W3.1-5.4-0.25	AA
241	LX-RZ3011GEFJ		Washer	AA
MECHANICAL PARTS				
601	CCABB1077TEV0	U	Main Frame Ass'y	—
602	CCABA3044TEV0	U	Top Cabinet Ass'y	—
602-1	TLABS0002UMZZ	U	Label	
603	GBDYU3052UMZZ	U	Bottom Plate	—
604	GCõVA1511UMZZ	U	Antenna Terminal Cover	—
607	LHLDZ1609UMZZ	U	Y/C Holder	—

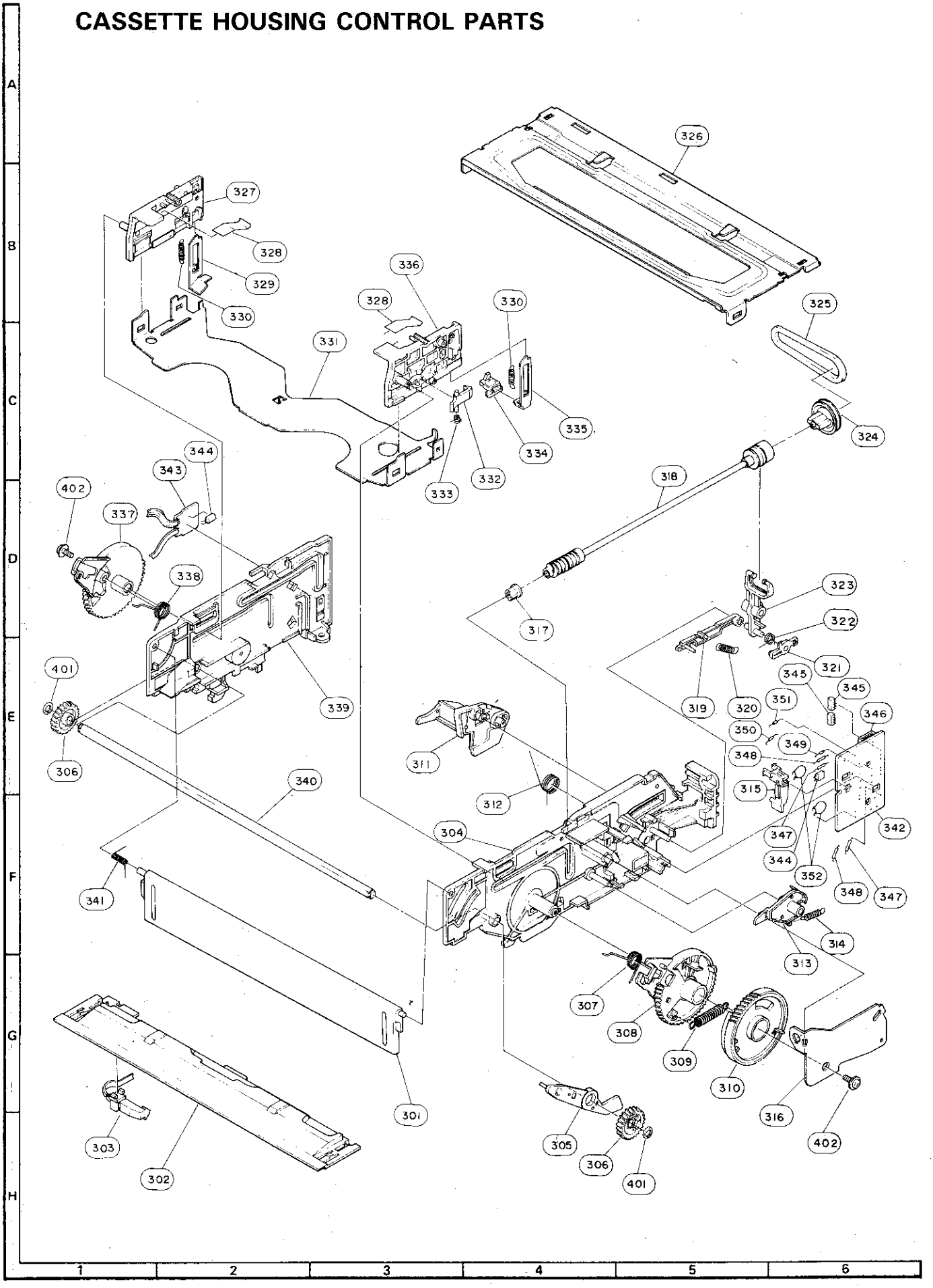
REF. NO.	PART NO.	★	DESCRIPTION	CODE
608	QEARP0276UMFW	U	Earth Plate, Upper	—
609	MSPRC0145UMFJ	U	Spring, Power	—
610	XEBSD30P12000		Screw	AA
611	XHPSD30P06WS0		Screw	AA
612	XEBSD40P12000		Screw	AA
614	LX-HZ3040GEFF		Screw, Top Cabinet	AA
615	LHLDP1089GE00		Power LED Holder	AA
617	LHLDZ1614GEZZ		Display Holder	AC
619	TLABM0074UMZZ	U	Model Label	—
620	LHLDZ1624GEZZ		Holder	AC
621	LHLDZ1619UMZZ	U	Tuner Holder	—
622	PSPAZ0202GEZZ		Spacer	AC
623	LX-HZ3047GEFF		Screw, Bottom Plate	AA
624	PFLT-0069GEZZ		Felt	AA
625	PSPAZ0200UMZZ	U	Spacer	—

REF. NO.	PART NO.	★	DESCRIPTION	CODE
FRONT PANEL PARTS				
501	CPNLC1537TEV1	U	Front Panel Ass'y	—
501-2	JBTN-2227UMSA	U	Record Button	—
501-3	PCōVU9135GESB		Front Window Filter	AF
501-4	LHLDS1010UMZZ	U	Door Holder	—
501-5	GCōVA1425UMZZ	U	R/C Cover	—
501-6	HDECQ0533UMSA	U	Front Decoration Cover	—
501-7	HiNDP1546UMSA	U	Indication Plate (Inside the door)	—
501-9	GDōRF1522UMSA	U	Timer Door	—
501-10	QEARP0272UMFW	U	Earth Plate	—
502	XEBSD30P12000		Screw	AA
503	CBTN-2232TEV0	U	Operate/Eject Button Ass'y	—
503-1	JBTN-2232UMSA	U	Operate/Eject Button	—
503-1-1	GCōVA1503UMSA	U	LED Cover	
504	TLABH0420UMZZ	U	Dew Caution Label	—
505	TLABZ0220UMZZ	U	U.K. Label	—
506	TCAUH3178UMZZ	U	Caution Label	—

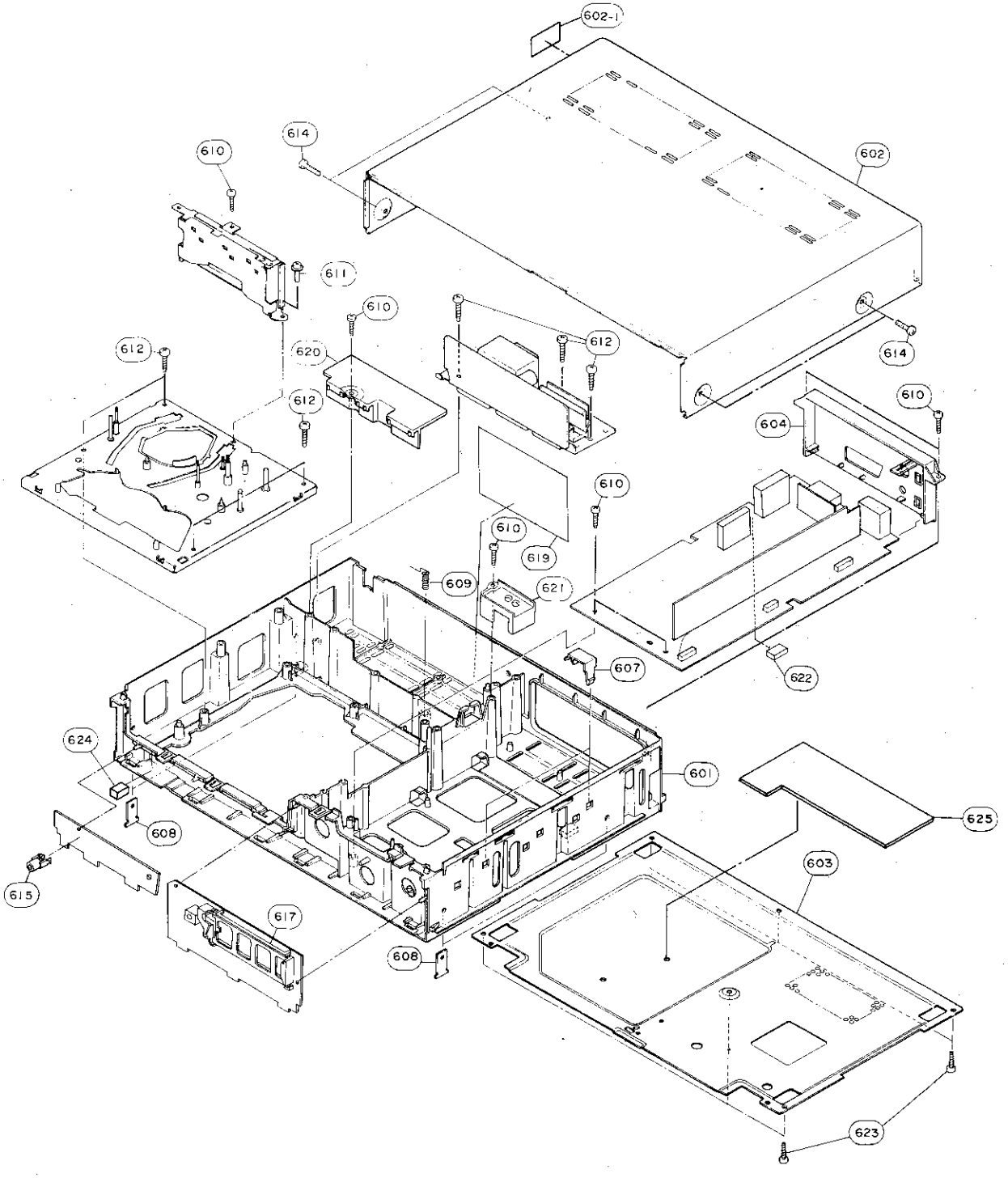
MECHANISM CHASSIS PARTS



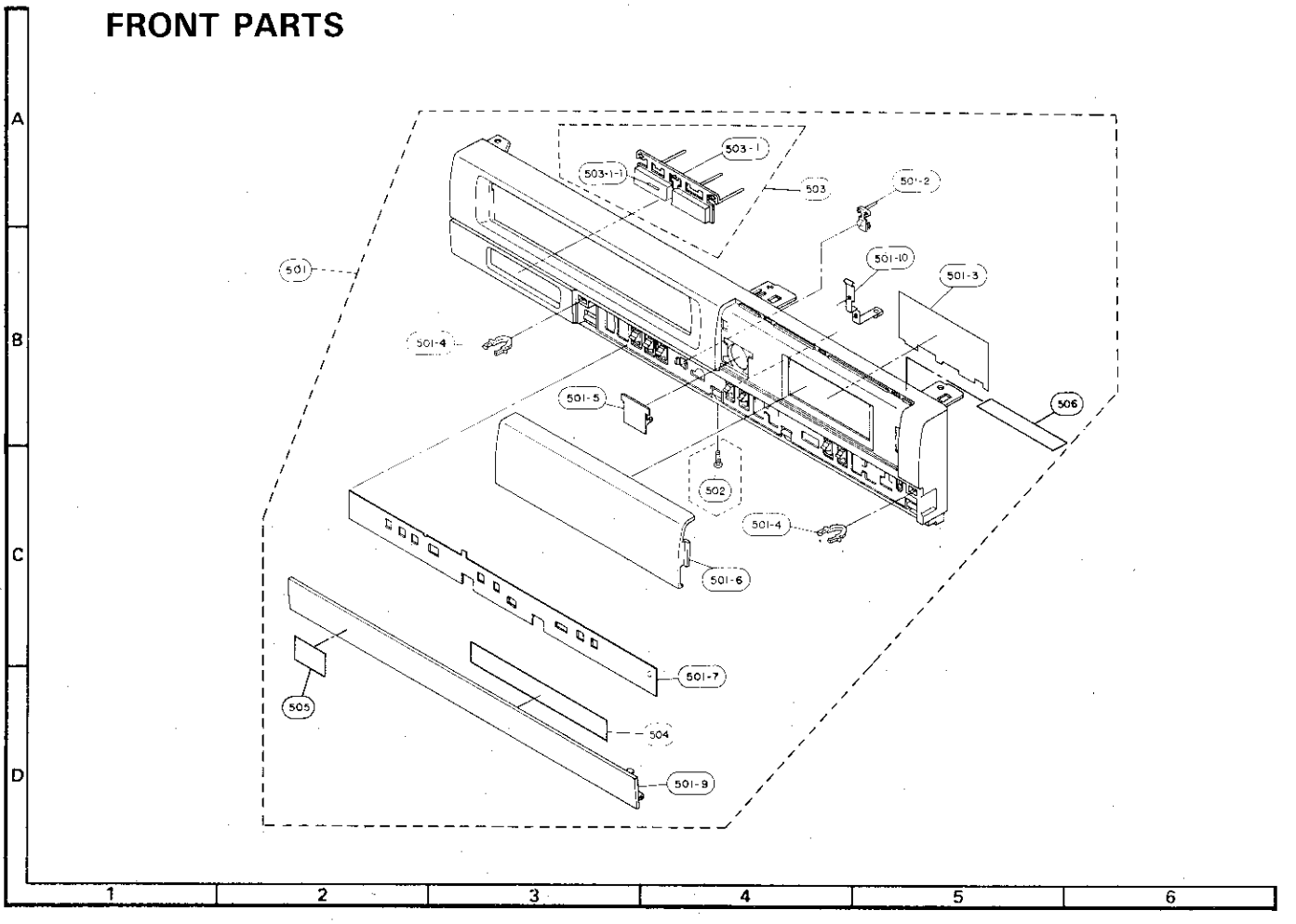
CASSETTE HOUSING CONTROL PARTS



MECHANICAL PARTS



FRONT PARTS


A
B
C
D
1
2
3
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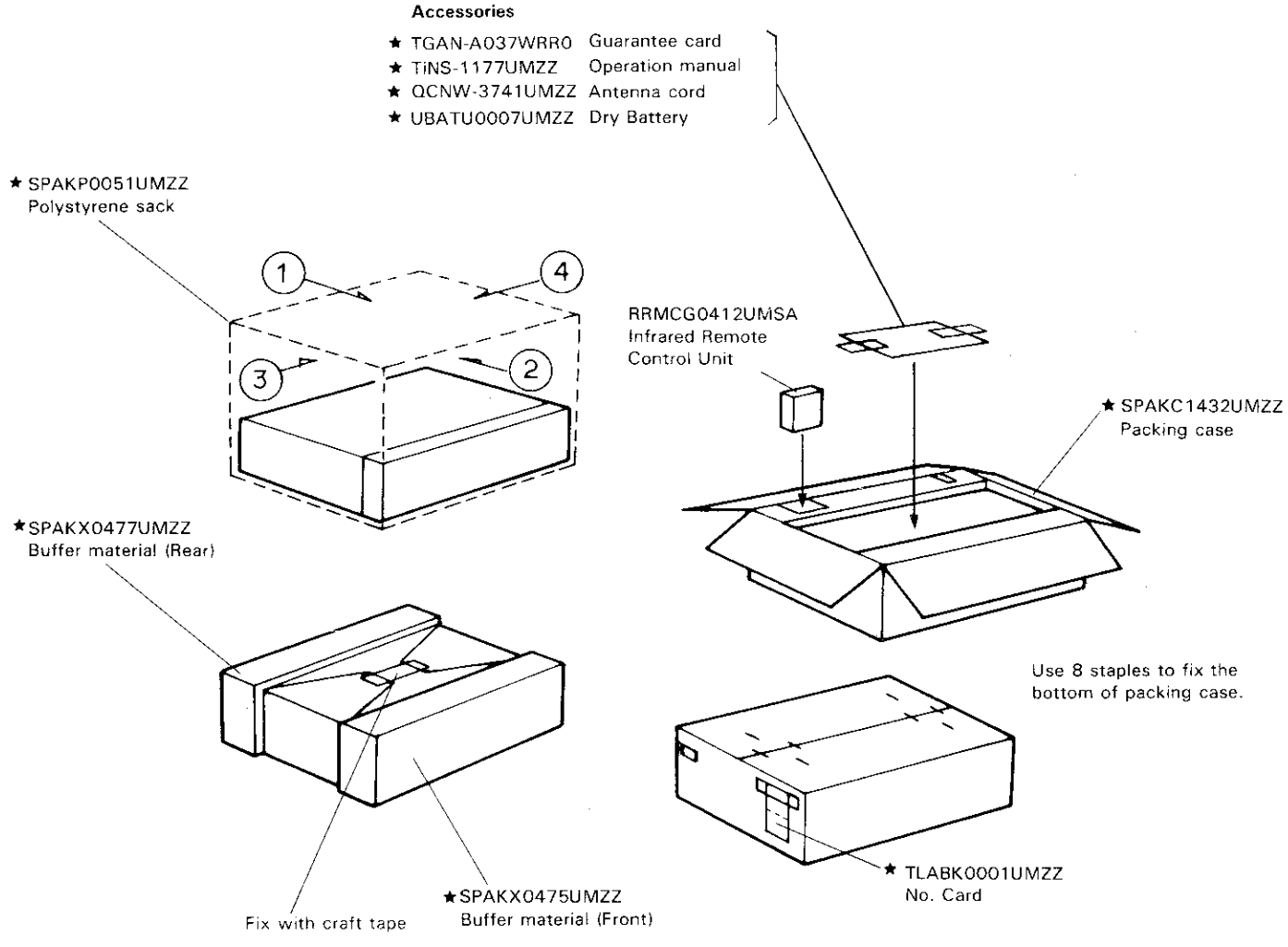
503-1
503-1-1
503
501-2
501-10
501-3
501
501-4
501-5
506
502
501-4
501-6
501-7
505
504
501-8

PACKING OF THE SET

■ **Setting positions of the knobs**

Colour mode switch	at "Auto" Position	RF converter output	E 36 CH
Band selector	at "Normal" Position	Test signal switch	at "Off" position



★ Not Replacement Item

VC-A105HM

SHARP

Printed in the U.K. by IMPACT PRINT SERVICES MANCHESTER LTD., Printworks Lane, Manchester M19 3JP Tel: 061-224 657

SHARP TECHNICAL MANUAL

T98i2VC-A111X

VHS VIDEO CASSETTE RECORDER

(PAL SYSTEM)

SERIES	MODEL NO.	VIDEO HEAD
VC-A111 Series	VC-A111X,NZ,S(BK,W),SM(BK),HM	2-head system
VC-A105 Series	VC-A105X,NZ,S(BK),B,YM(BK),HM,SM(BK),E,W,VC-B320N	
VC-A211 Series	VC-A211G(BK),YM(BK),GM(BK)	
VC-A244 Series	VC-A244GM(BK)	
VC-T212 Series	VC-T212GM(BK)	
VC-T310 Series	VC-T310S(BK),H,SM(BK),HM	
VC-T410 Series	VC-T410G(BK),GM(BK)	
VC-A114 Series	VC-A114D	
VC-A505 Series	VC-A505X,NZ,S(BK),SM,W,VC-B370N	Double azimuth 4-head system
VC-A605 Series	VC-A605G(BK),S(BK),GM(BK),YM(BK)	
VC-T510 Series	VC-T510X,HM	

CONTENTS

1. MECHANISM 2
2. SERVO CIRCUIT 20
3. SYSTEM CONTROLLER LSC 25
4. TIMING CHART 49
5. TIMER CIRCUIT 56

SHARP CORPORATION

1. MECHANISM

OUTLINE

This VTR is a low-profile, shelf-mount type working on the VHS system. Many newly developed mechanisms have been adopted to make this model thinner, more reliable and power-saving compared to the conventional models.
Main features include:

1) Use of a single-cam system which can cope with various modes
2) A newly developed thin capstan DD (Direct Drive) motor
3) Appropriate torques achieved by a geared reel drive system
4) Newly developed loading system for systemization of the cassette control and loading mechanisms

CONFIGURATION

The mechanism of this model can be roughly divided into the following sections.
System sections

1) Tape drive train system
2) Loading mechanism
3) Cassette tape take-up mechanism
4) PAD (Power Assist Drive) mechanism
5) Cam switch
6) Cassette control mechanism

These sections are discussed one by one as follows.

1-1. Tape Drive Train System

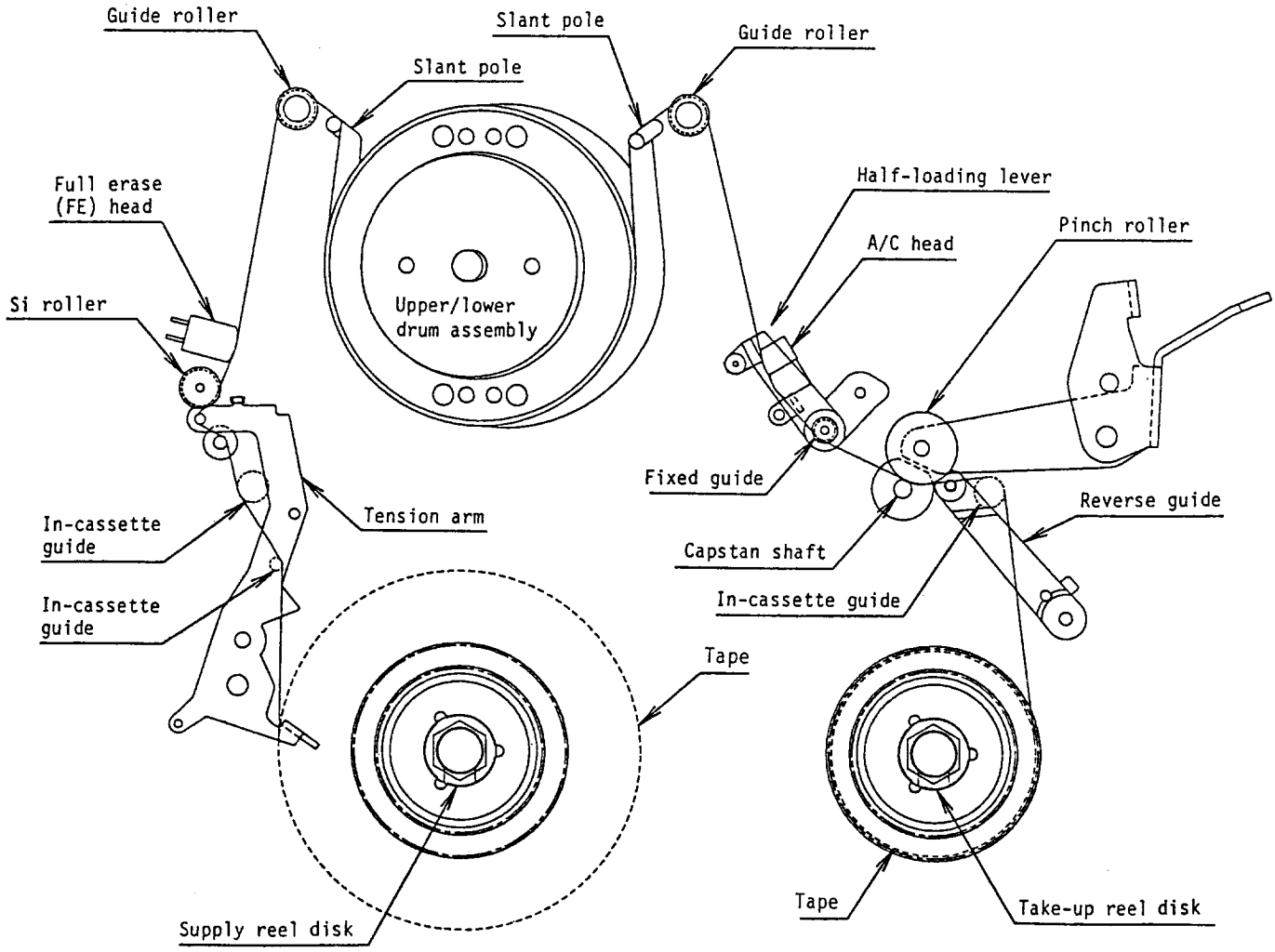


Figure 1-1. Tape Travel System

Features

1) Miniaturized Si (Supply impedance) roller from 16 mm to 7 mm dia.; much smaller mechanism realized.
2) Fixed erasing head; simple design.
3) Enlarged guide roller from 6 mm to 7 mm dia.; reduces the number of revolutions in high-speed video search operation.
4) Miniaturized pinch roller from 18 mm to 14 mm dia.; subcompact mechanism accomplished.
5) The reverse guide works in Video search (VS) and rewind (REW) modes only, reducing the risk of tape damage.

1-2. Loading Mechanism

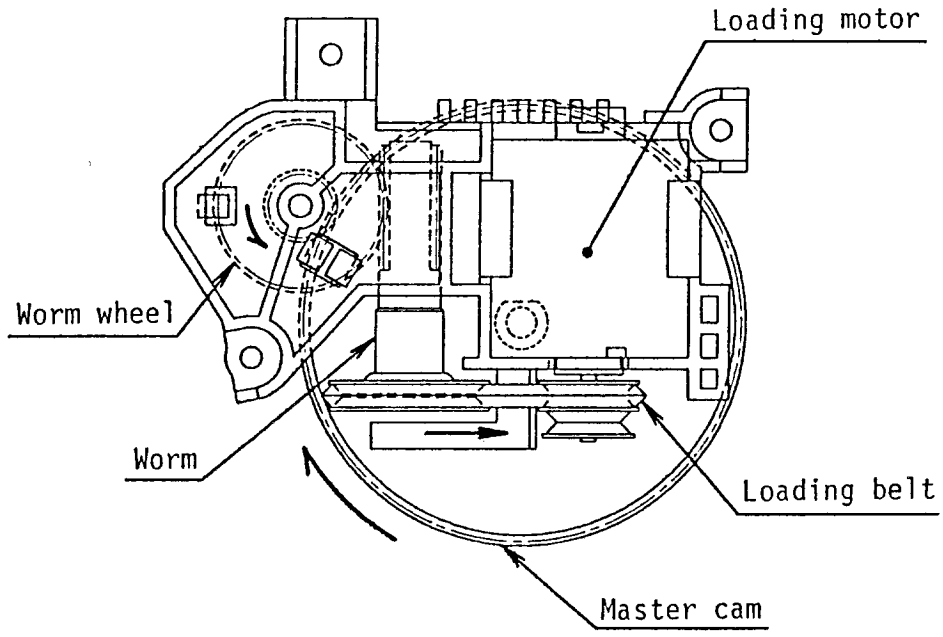


Figure 1-2. Loading Mechamism (Upper stage)

Features

1) The mechanism is driven by the loading motor.
2) The loading motor is intended to drive the mechanism and the cassette housing.
   (Refer to the description on the clutch shifting mechanism on page 17.)
3) The four-cam system which used to control the operation of the whole transport mechanism has been combined into a single master cam.

1-3. Cassette Tape Take-up Mechanism

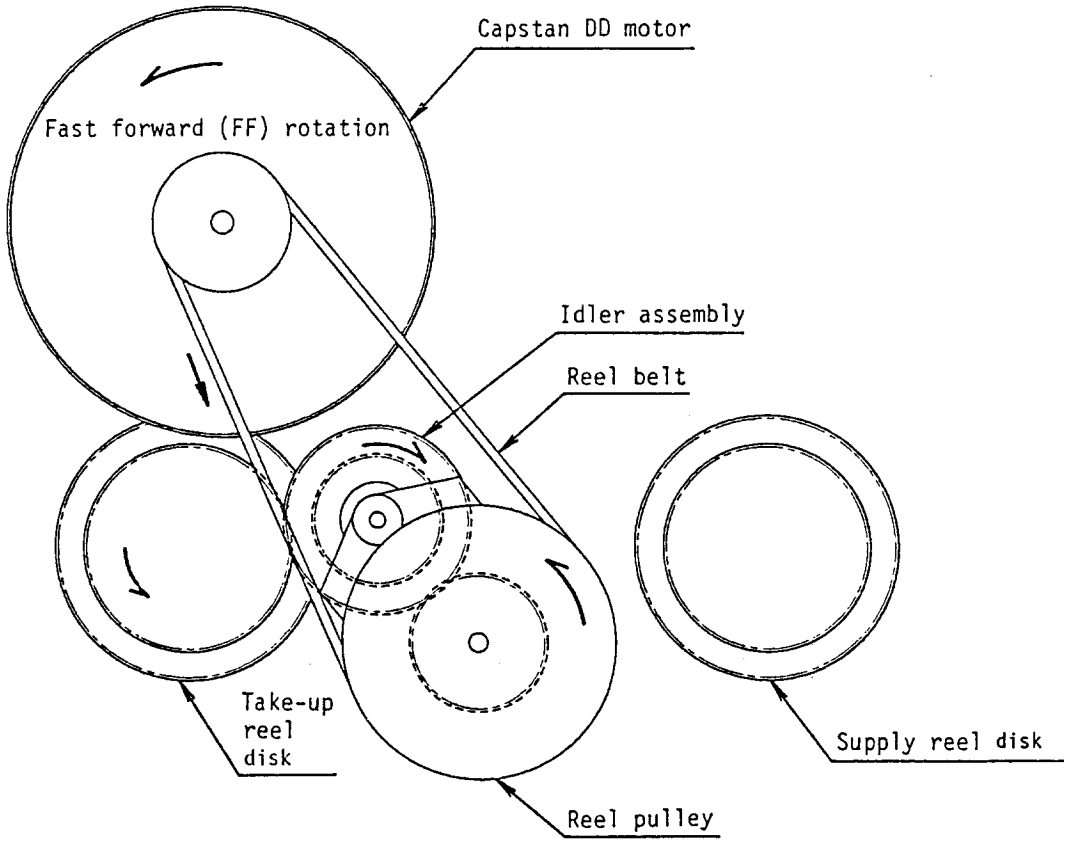


Figure 1-3. Cassette Tape Take-up Mechanism 1 (Lower stage)

Features

1) The reel disk to be driven by the idler assembly is switched by changing the rotational direction of the capstan DD motor.
2) The reel pulley and the idler assembly are always engaged with each other, and the rotation of the capstan DD motor is transmitted through the reel belt to the supply or take-up reel disk.
3) The idler assembly consists of a large and a small gear in a monoblock construction and mounted in the mechanism to allow vertical slide operation.
4) Each reel disk incorporates a slip mechanism to take up the tape without any slack and at an appropriate take-up torque in recording, playback and trick play operations. (large gear)

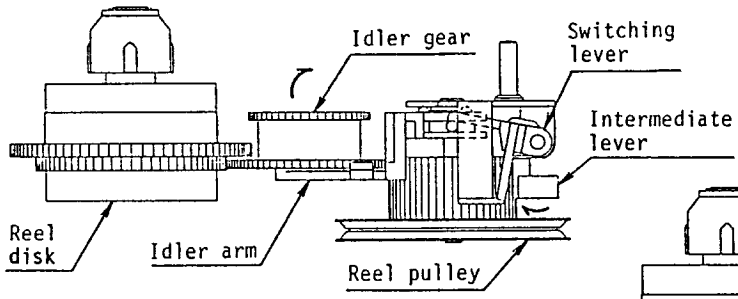


Figure 1-4. Gear Engagement in Fast Foward and Rewind Operations

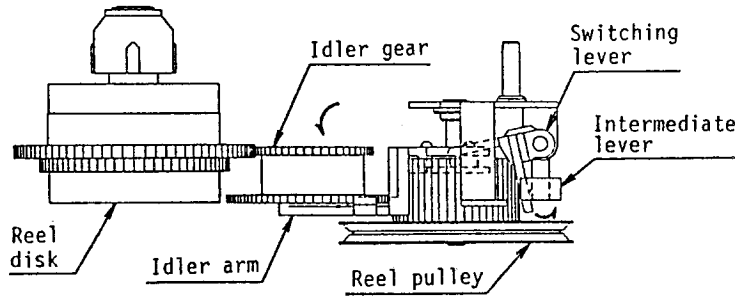


Figure 1-5. Gear Engagement in Recording, Playback and Trick Play Operations

5) In the fast forward and rewind modes, the large idler gear engages with the small gear of the reel disk, not through the torque limiter built in the reel disk. They work as a simple gear mechanism to transfer the revolving motion to the reel disk. (Figure 1-4.)
6) In the recording, playback and trick play modes, the idler arm moves to the lower position so that the small idler gear engages with the large gear of the reel disk. In this case, the rotation of the idler assembly is transmitted through the torque limiter built in the reel disk to the reel disk. (Figure 1-5.)

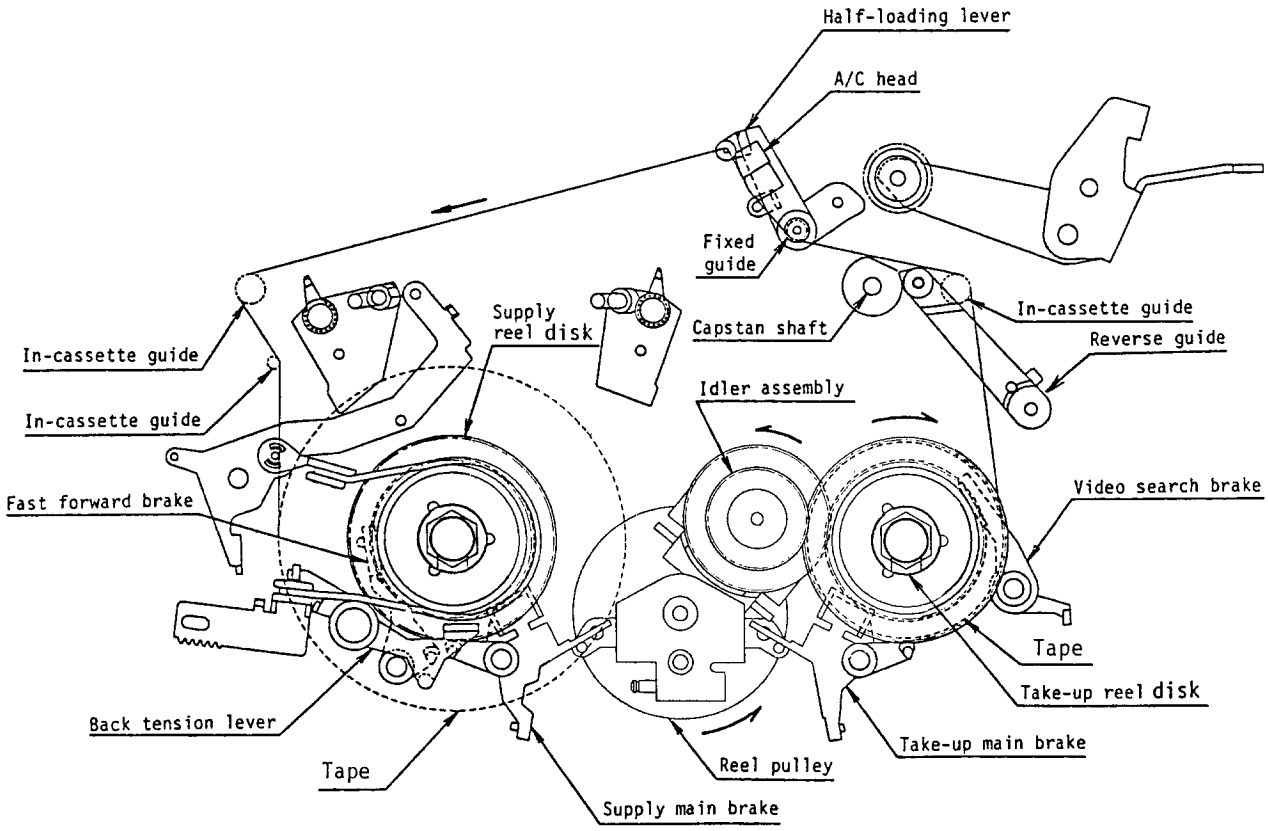


Figure 1-6. Cassette Tape Take-up Mechanism 2 (Upper stage)
Fast forward operation

7) In fast forward and rewind operations, a back tension is provided by the fast forward brake and video search brakes. (Figures 1-6. and 1-7.)
8) The idler gear is positioned as shown in Figure 1-5. when tape loading is completed. The limiter gear of the take-up reel disk then goes into an operating condition, and its sliding motion absorbs the change in tape diameter while the tape is being wound in order to compensate the reel's revolving speed. (Figures 1-5. and 1-8.)
9) In playback and recording operations, a back tension is provided by a combined force of the tension band, tension arm and tension spring at the supply reel disk. (Figure 1-8.)
10) The back tension in the VS and REW modes is given by the video search brake for the take-up reel disk. (Figure 1-9.)

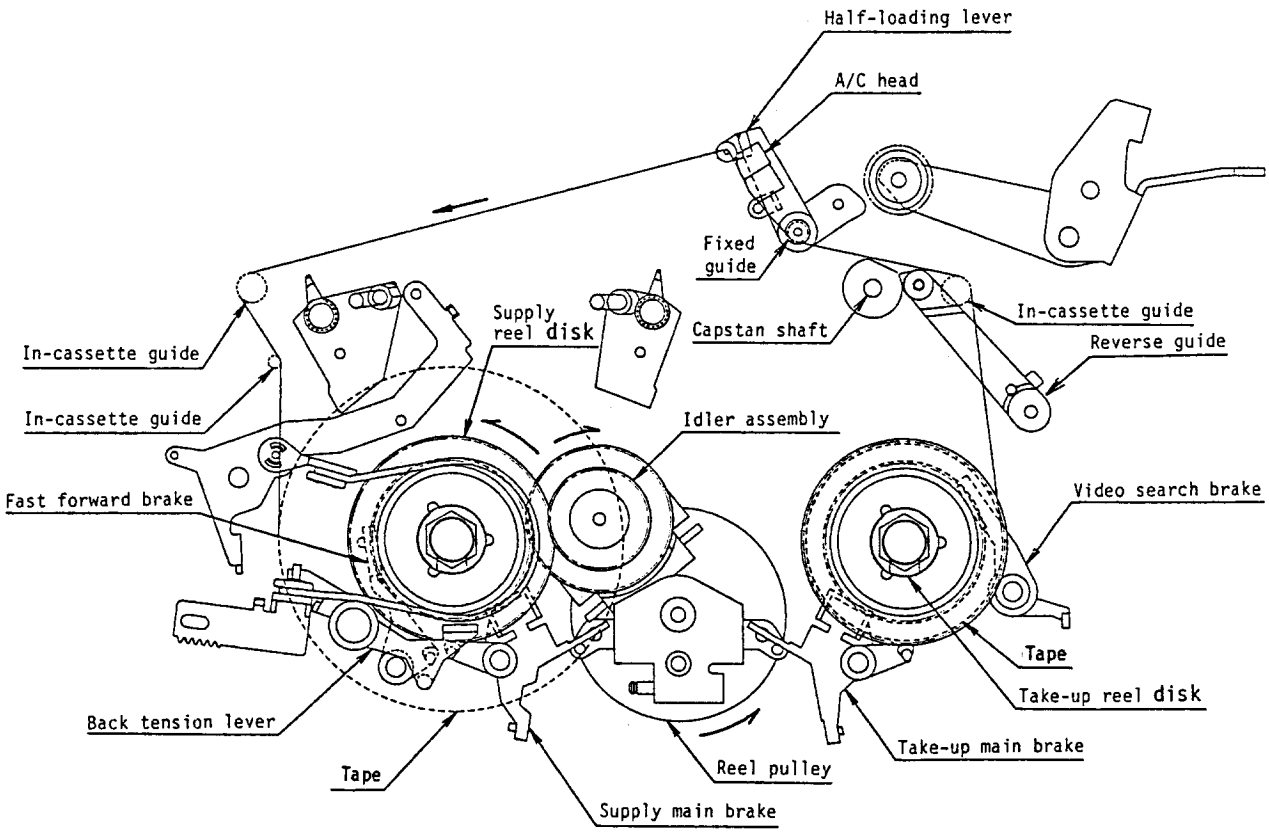


Figure 1-7. Cassette Tape Take-up Mechanism 3 (Upper stage)
Rewind operation

11) In the VS and REW modes, the tension release lever slackens the tension band so that only the brake of the back tension lever acts on the supply reel disk. (Figure 1-9.)
12) The reverse guide works in the VS and REW modes in order to stabilize tape drive train during reverse running. (Figure 1-9.)

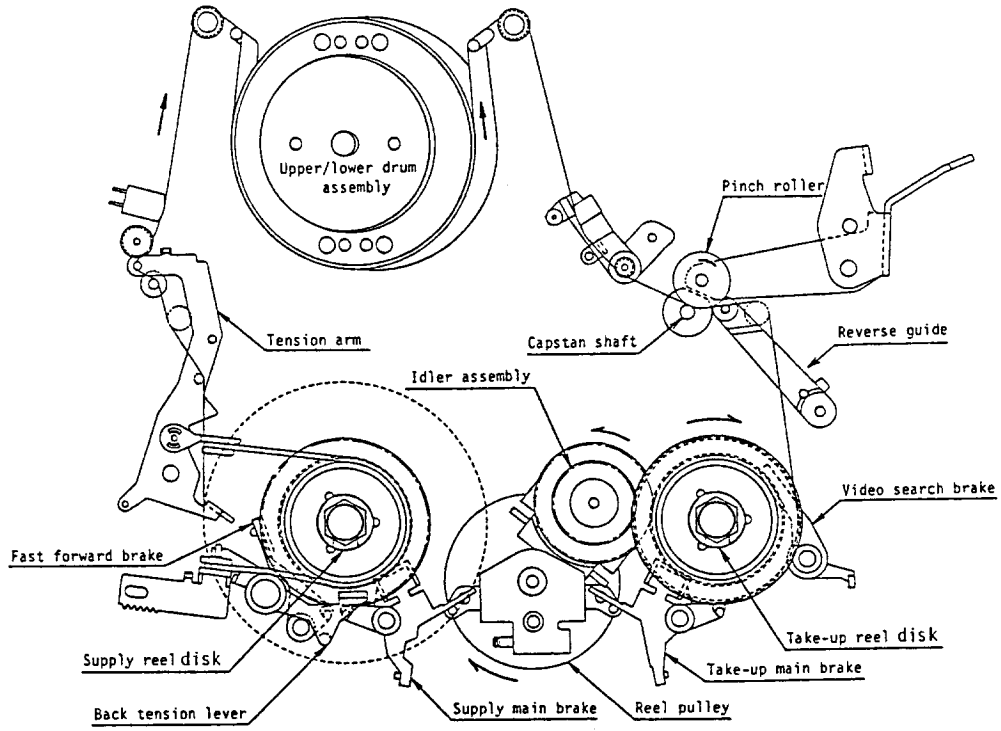


Figure 1-8. Cassette Tape Take-up Mechanism 4 (Upper stage)
Recording and playback opertions

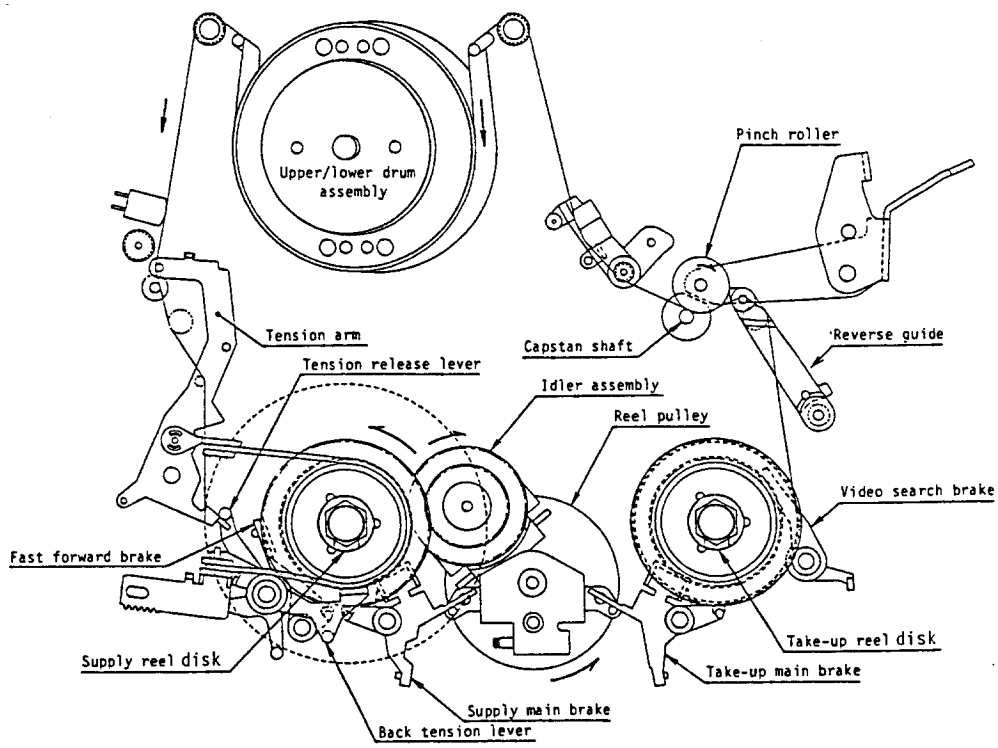
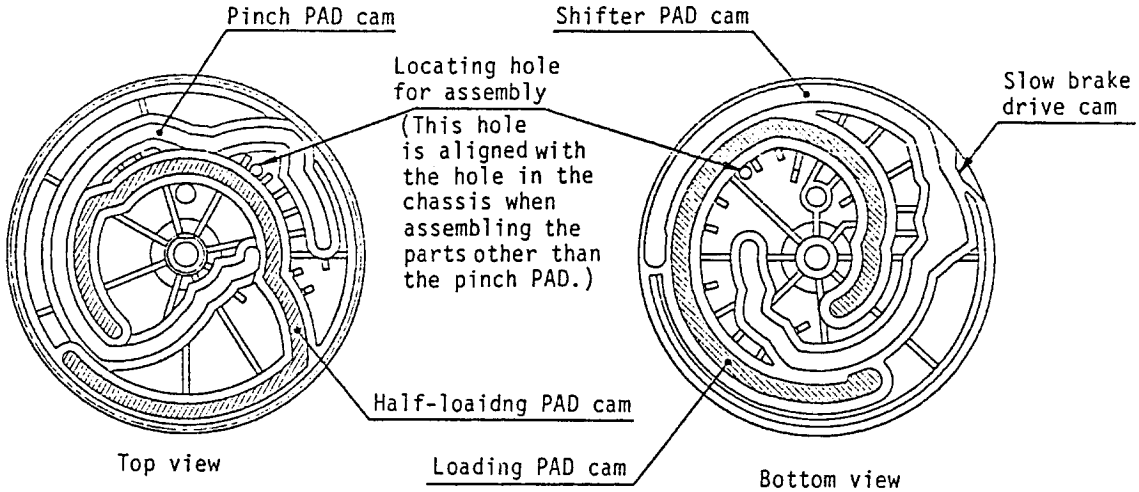


Figure 1-9. Cassette Tape Take-up Mechanism 5 (Upper stage)
VS and REW operations

1-4. PAD (Power Assist Drive) Mechanism

1) Master cam grooves

As shown in Figure 1-10., the single master cam has some grooves on its both sides to bring the mechanism in various modes. The control levers are guided along these grooves. Precise switching is also guaranteed with the interlocking of this cam and the cam switch.



Figue 1-10.

2) Positional relation and operation of loading gears

The loading gear S is aligned with the loading gear T so that the locating mark 1 (round projection) of the former gear engages with the notch on the circumference of the latter gear. See Fig. 1-11.

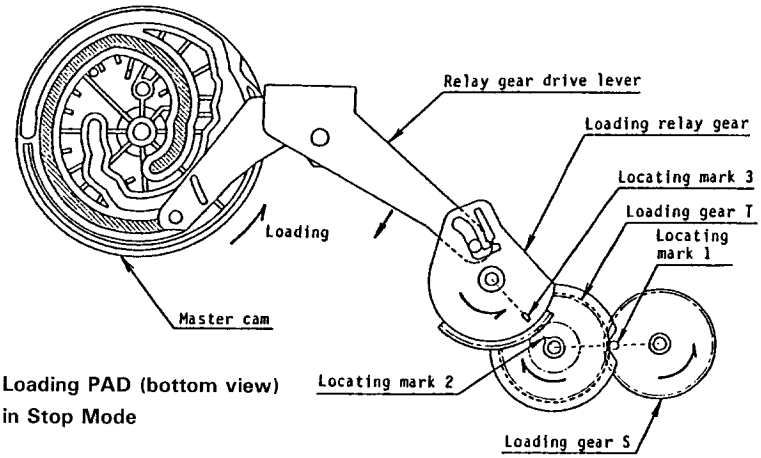


Figure 1-11. Loading PAD (bottom view) in Stop Mode

Next, the locating mark 2 of the small gear of the loading gear T is aligned with the locating mark 3 of the loading relay gear.

Figure 1-11. and Figure 1-12. show the positional relation in Stop and Play mode, respectively. Note the difference in the position of the relay gear drive lever with respect to the master cam groove between two modes.

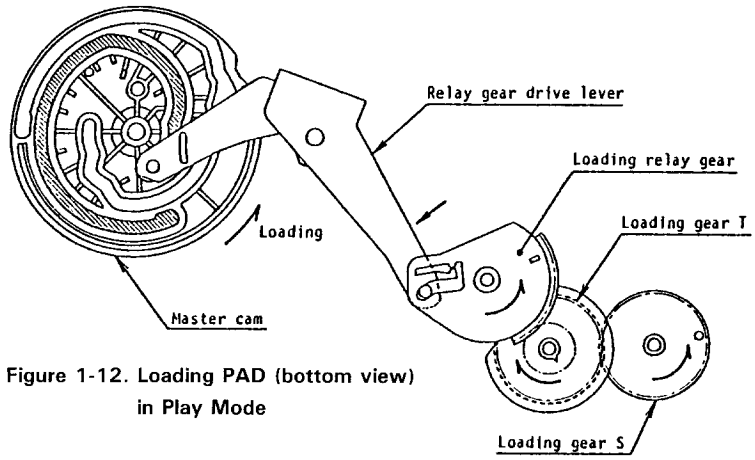


Figure 1-12. Loading PAD (bottom view) in Play Mode

3) Positional relation and operation of pinch roller lever (other than in eject operation)

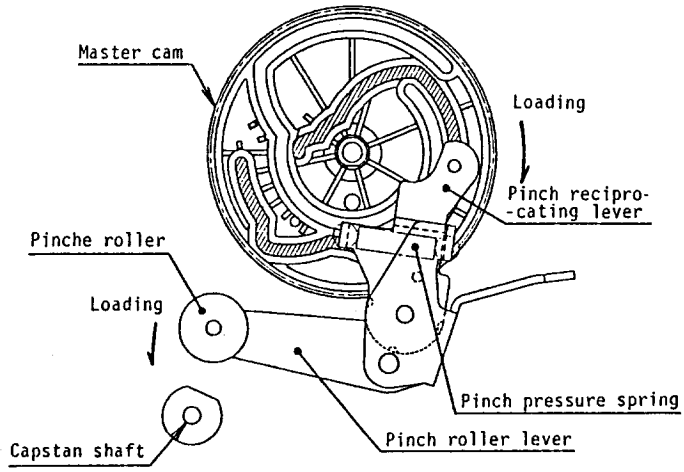


Figure 1-13. Stop Mode (FF/REW)

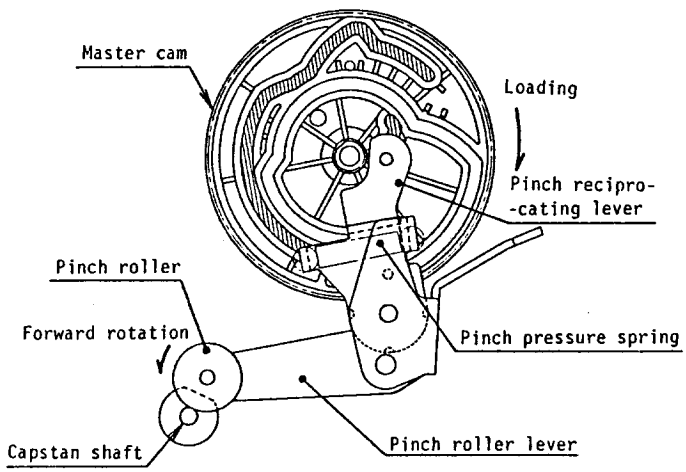


Figure 1-14. Playback Mode

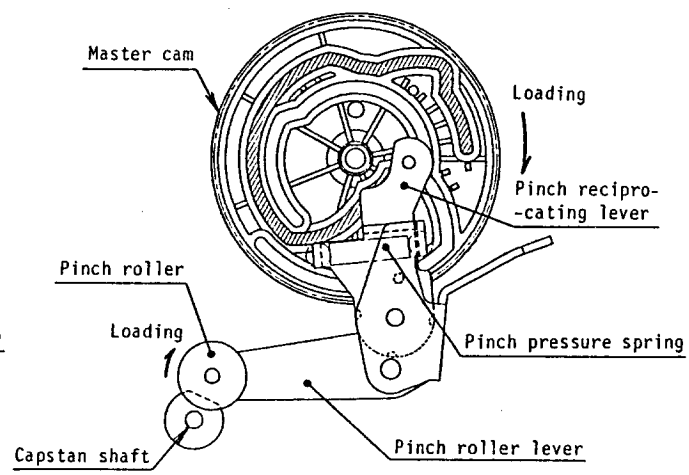


Figure 1-15. Positioning in Pause Mode

When the pinch roller has been pressed against the capstan shaft, the master cam rotates to the position shown in Figure 1-14. Then, the pinch pressure spring gives a necessary pressure (1,000 - 1,200 g) to feed the tape.
Just before going to the video search rewind mode or at short rewind operation in the REC/PAUSE mode, the master cam once rotates to the position shown in Figure 1-15. to slightly release the pinch roller pressure; this is just to allow the capstan to feed the tape while the idler assembly is shifting toward the supply reel disk. Then, it reverts to the position shown in Figure 1-14. and feeds the tape in the reverse direction to ensure stable tape reversing.

4) Operation of half-loading lever

- The cassette is loaded in the normal position only in the FF and REW modes by the master cam and released in the other modes.
- The half-loading lever is always kept at a fixed position by the half-loading reciprocating lever, half-loading reciprocating spring and half-loading drive lever.

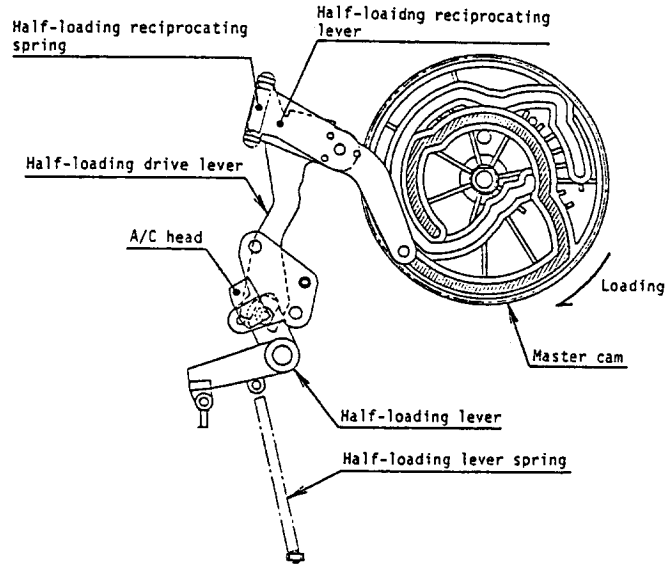


Figure 1-16. Eject Mode

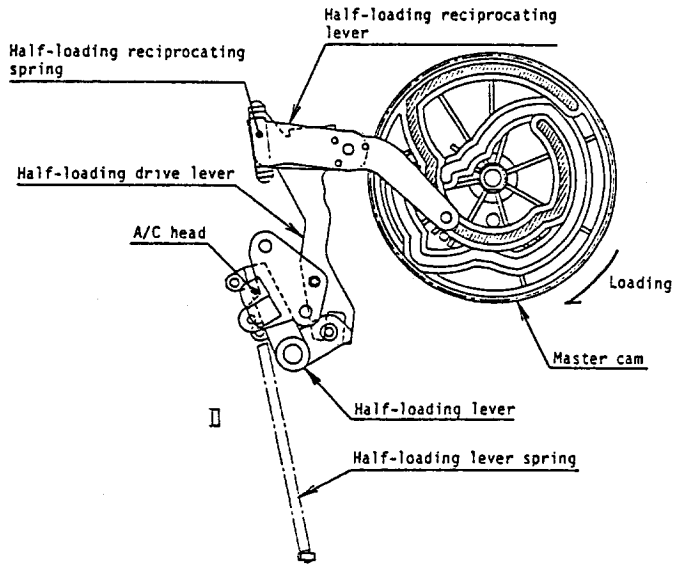


Figure 1-17. Stop Mode (FF/REW)

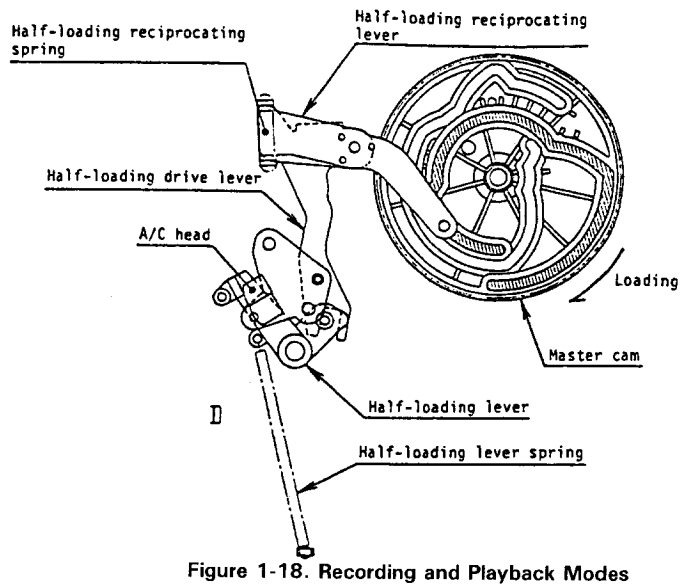


Figure 1-18. Recording and Playback Modes

5) Operation of brake shifter

The relay shifter transfers the driving force of the master cam to the brake shifter to cause a linear motion of the brake shifter as shown in Figure 1-19.

The brake shifter performs the following operations:

- Activation and Releasing of the main brake
- Vertical movement of the idler lever
- Activation and Releasing of the fast forward brake
- Activation and Releasing of the back tension brake
- Switching of the driving force of the video search brake
- Releasing of the tension arm

Further, the relay shifter performs activation and releasing of the reverse guide.

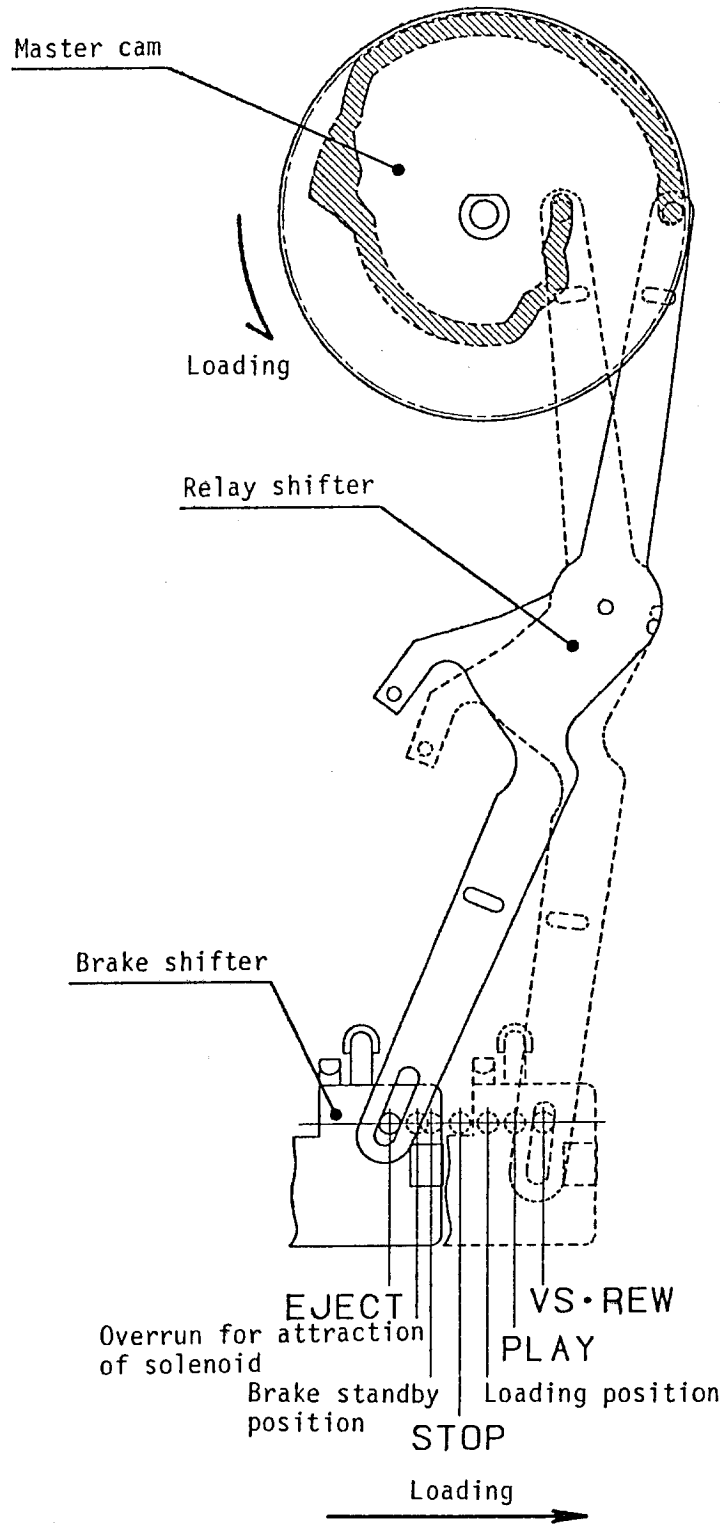


Figure 1-19.

1-5. Cam Switch

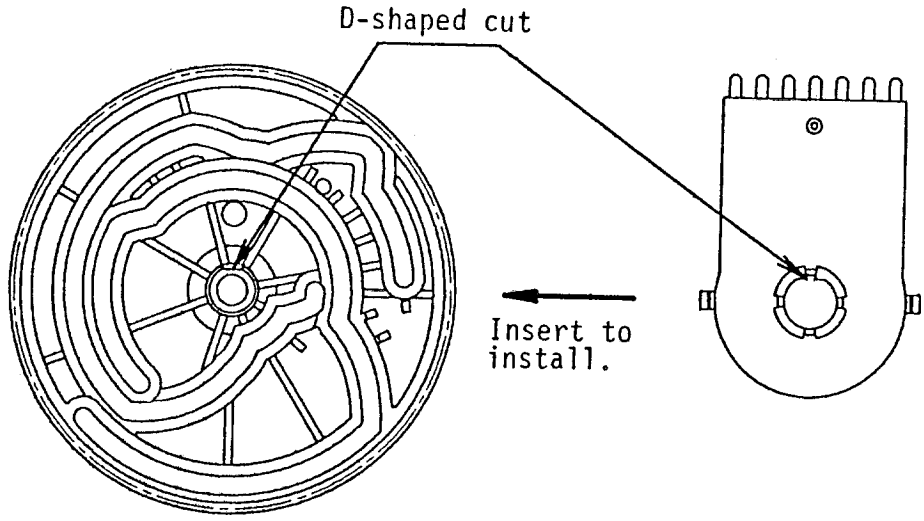


Figure 1-20. Cam Switch Alignment

The cam switch is installed with its D-shaped cut aligned with the D-shaped cut of the master cam. (The specially devised cam switch allows its alignment irrespective of the angle of rotation.)

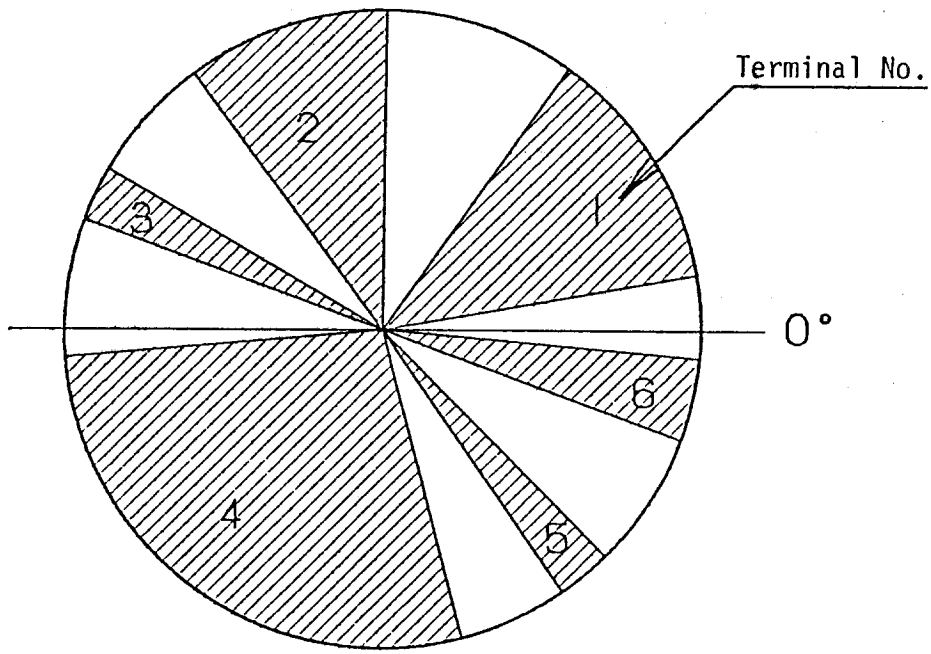


Figure 1-21. Structure of Cam Switch

The cam switch has an internal pattern as shown in Figure 1-21. and turns on the circuit at the shaded sectors. The system controller determines the mode of the mechanism by detecting turning on and off of the electric signal as the six shaded sectors make and break the circuit.

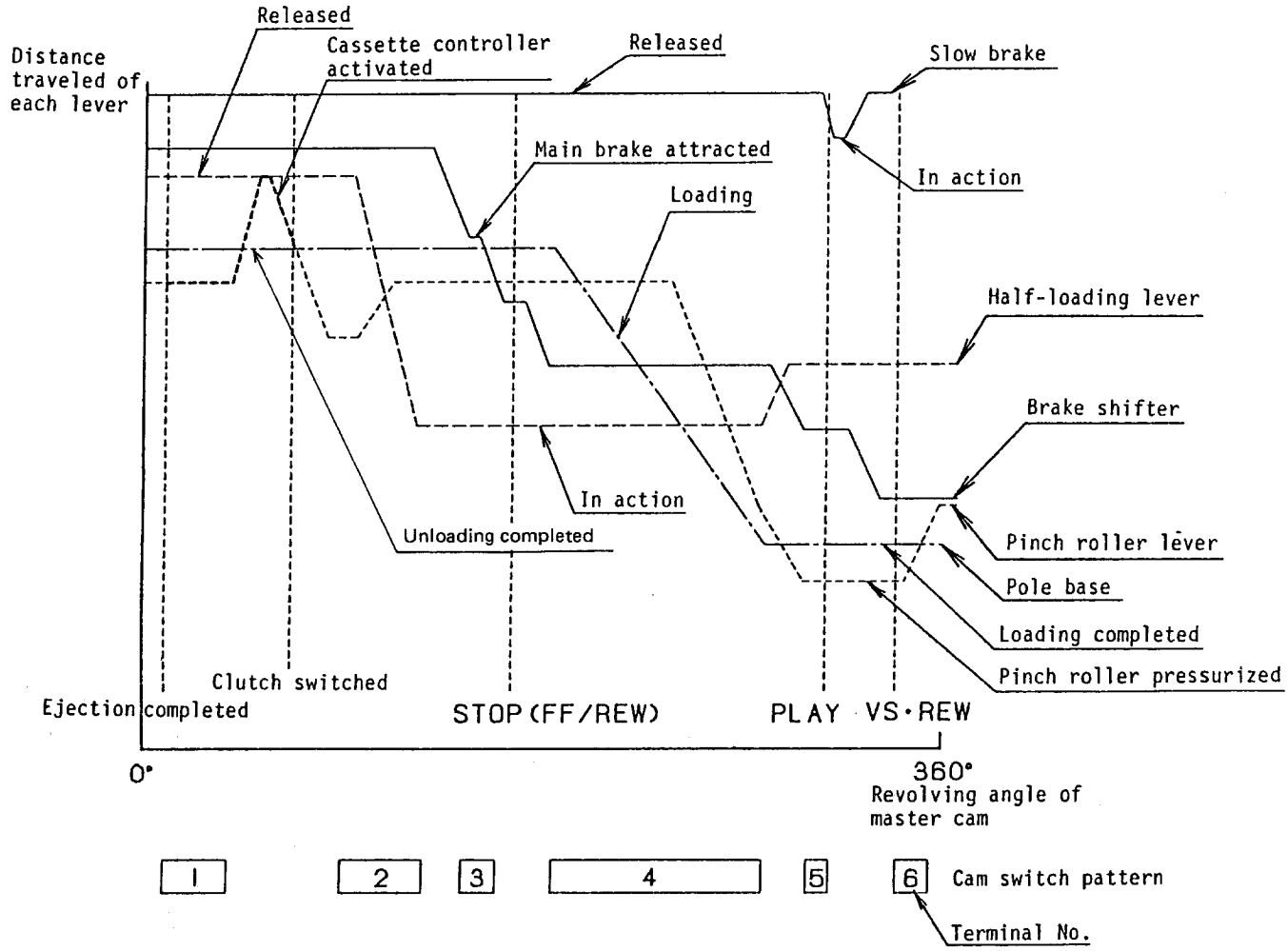


Figure 1-22. Relation between Cam Switch and Mechanism

Figure 1-22. shows the relation between the cam switch position and the actions of the individual components.

1-6. Cassette Control Mechanism

1) Cassette controller drive mechanism

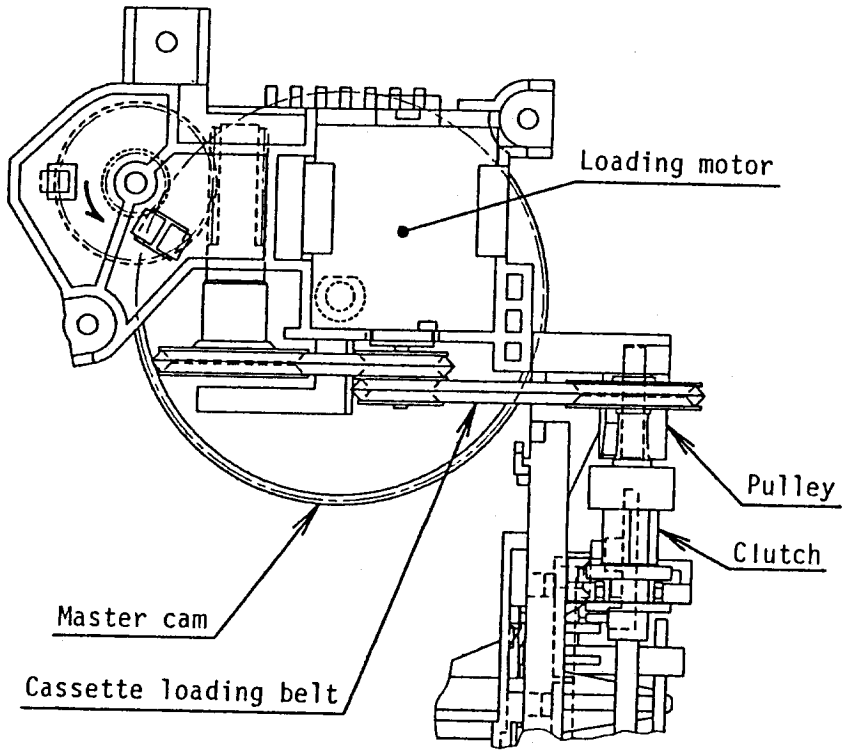


Figure 1-23. Cassette Controller Drive Mechanism

Feature

The driving force of the loading motor is always transmitted to the pulley of the cassette controller by the cassette loading belt as shown in Figure 1-23.

2) Configuration of cassette control mechanism

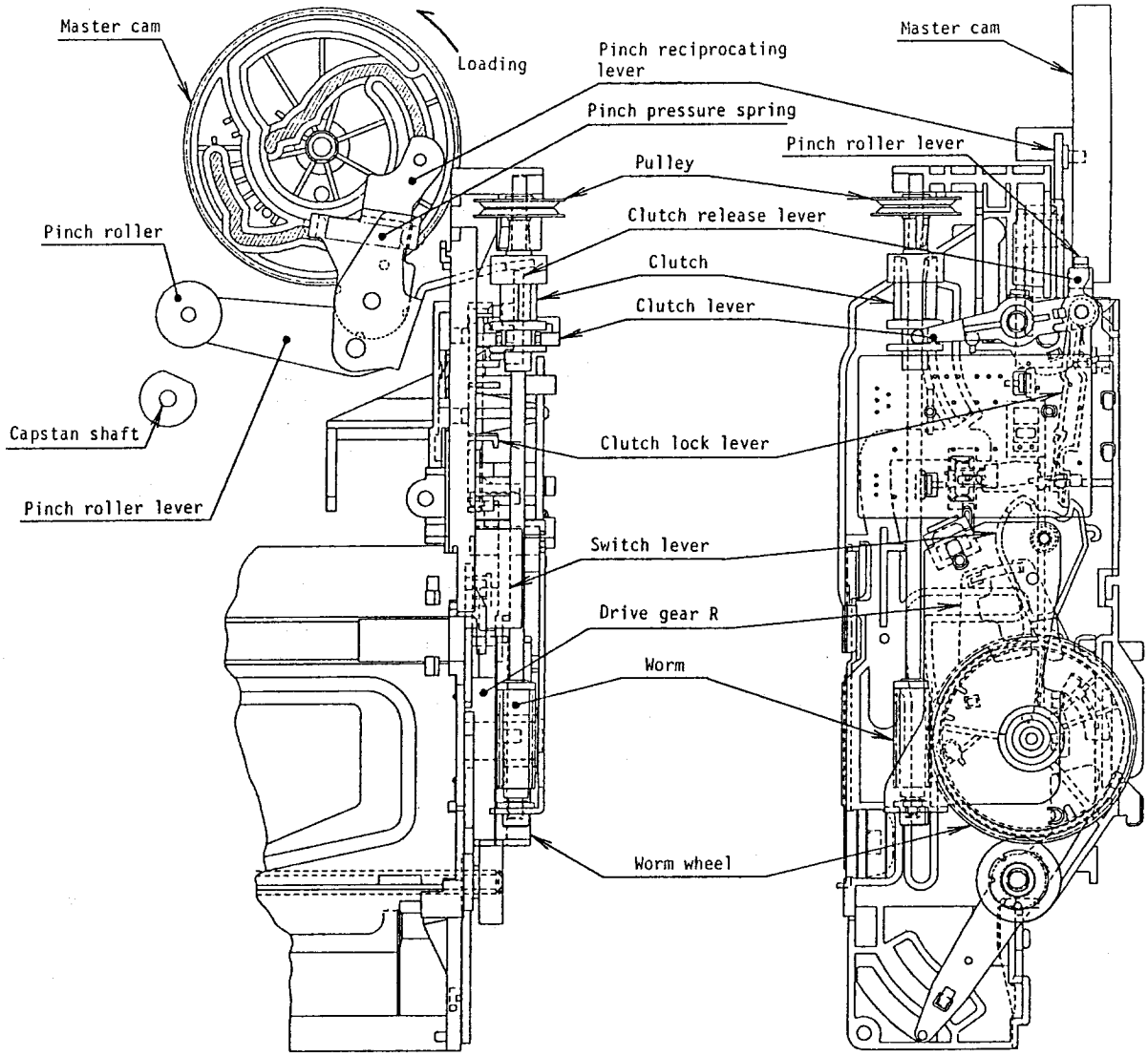


Figure 1-24. Relation between Pinch Roller Lever and Cassette Controller

The master cam acts on the pinch roller while the latter is positioned within the range where the pressurization of the pinch roller is not affected. The driving force of the loading motor is transmitted to the worm through the pulley.

1-7. Clutch Shifting Mechamism

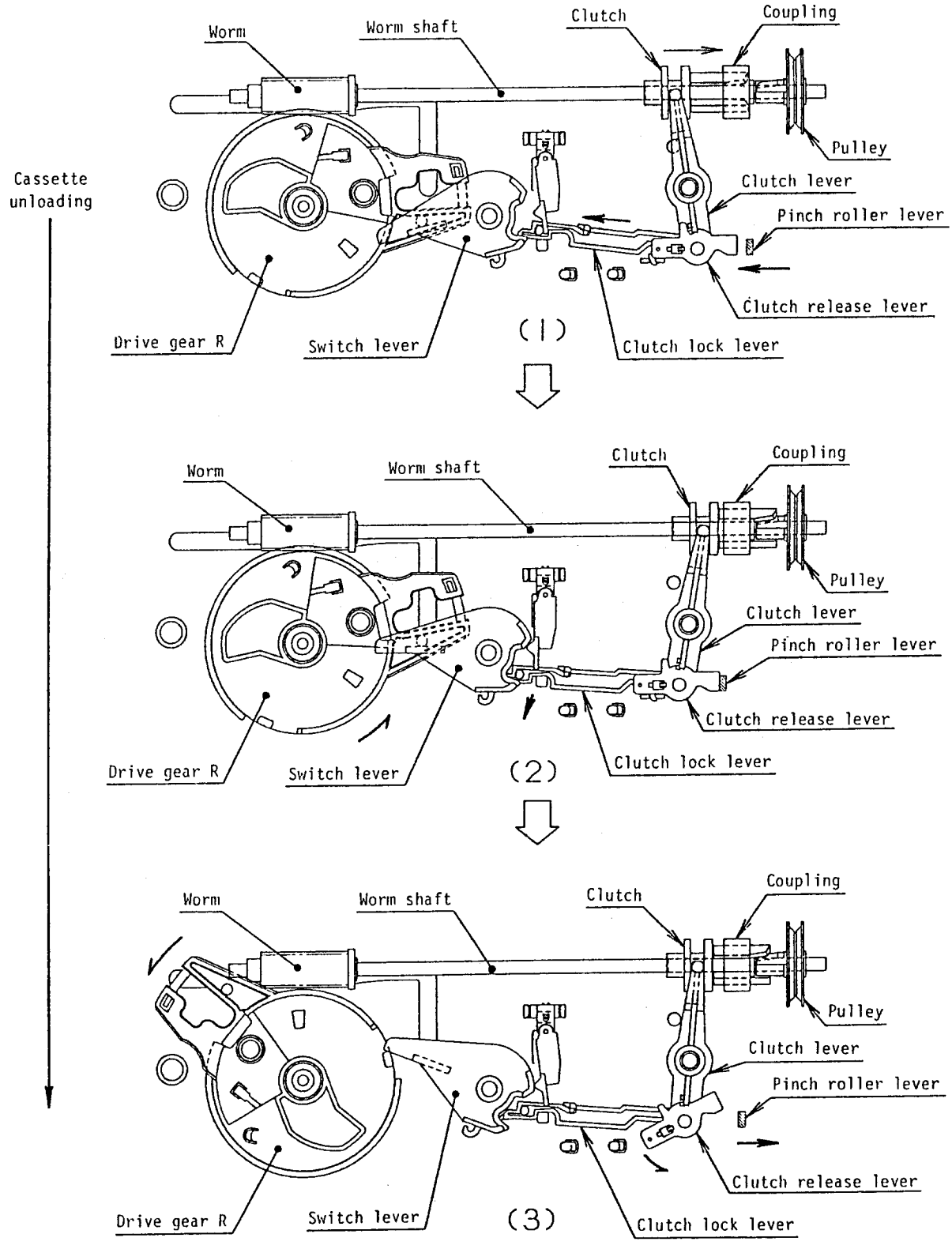


Figure 1-25. Cluch Shifting Sequence during Cassette Unloading

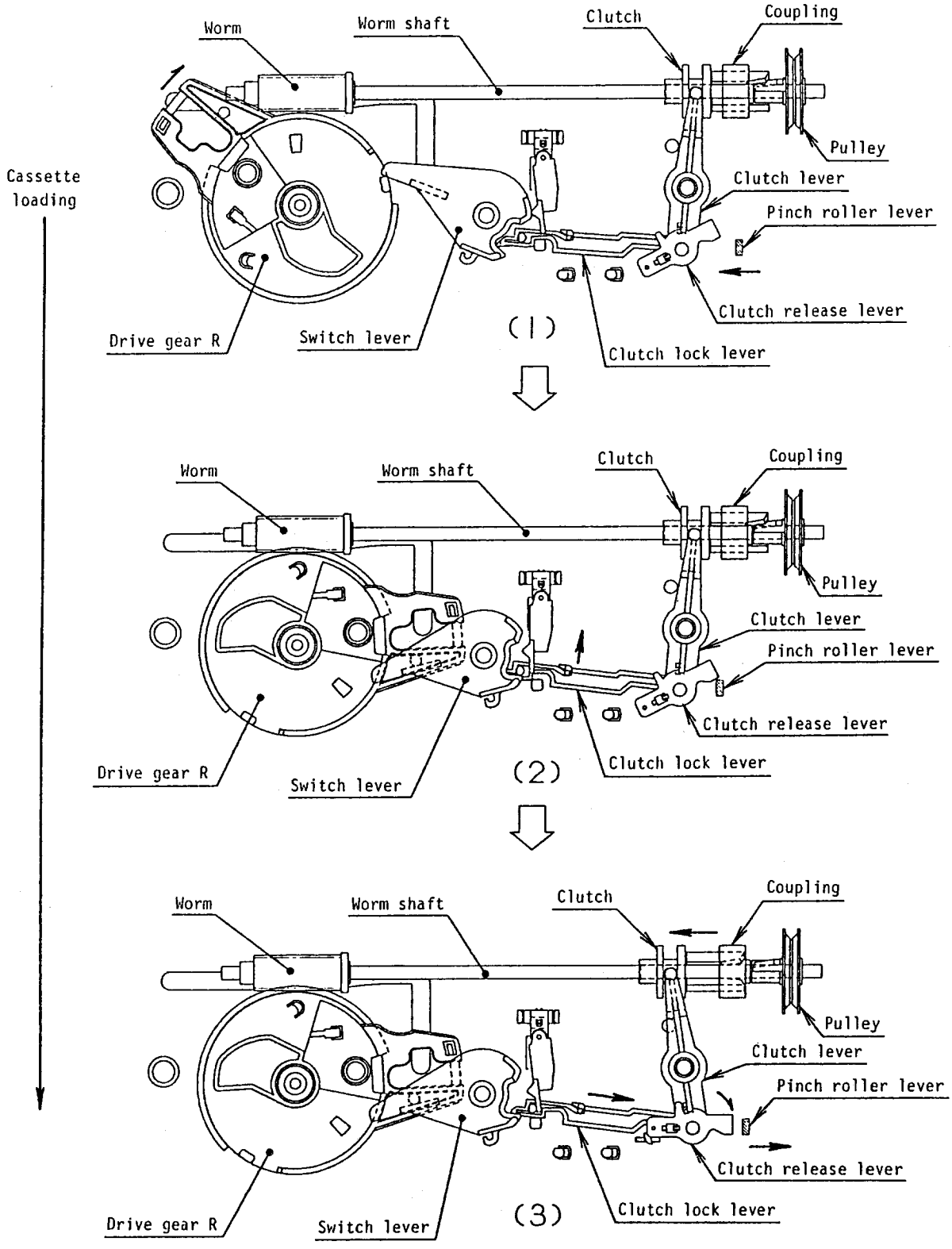


Figure 1-26. Clutch Shifting Sequence during Cassette Loading

1) Clutch Shifting Sequence during Cassette Unloading

The clutch is located as shown in Figure 1-25.(1) when the cassette has been loaded. In this condition the driving force of the pulley is not transmitted to the worm. As the pinch roller lever moves in the direction of arrow (a), the clutch, clutch lock lever and clutch release lever move in the directions (b), (c) and (d), respectively, bringing the positional relation in Figure 1-25.(2).
Now the driving force of the pulley is transmitted through the clutch and the coupling to the worm, which starts the drive gear R to unload the cassette.
At this time, the clutch lock lever is released from the switch lever and then fixed to the projection on the frame. By this the clutch is kept at a position even when the pinch roller lever comes to the position shown in Figure 1-25.(3).
When the drive gear R rotates to the position shown in Figure 1-25.(3), the switch lever turns on the switch and the motor stops. Now the cassette has been completely unloaded.

2) Clutch Shifting Sequence during Cassette Loading

Before a cassette is inserted, the clutch is positioned as shown in Figure 1-26.(1), where the driving force of the pulley is transmitted to the worm through the coupling.
When the cassette is inserted in this condition, the drive gear R starts turning by the reciprocating mechanism. Then the switch is released from the switch lever and the pulley starts turning to move the cassette in the loading direction. When the mechanism reaches a position just before completion of loading as shown in Figure 1-26.(2), the drive gear R forces the switch lever to rotate. Consequently, the clutch lock lever moves in the direction of arrow (e), releasing the clutch and turning on the switch at a time. Now the mechanism has loaded the cassette in position (Figure 1-26.(3)). The pulley remains running idle, and even when the loading motor is running, its force is not transmitted to the cassette controller.

2. SERVO CIRCUIT

Digital servo LSI (RH-IX0431GEZZ)

The digital servo LSI is of single-chip type and has the following functions.

- Drum speed and phase control.
- Capstan speed and phase control.
- Gain control for recording speeds (SP/LP).
- Automatic tape speed detection in playback mode.
- Head switching pulse generation in 1 PG system.
- X-value compensation in double-azimuth 4-head fine slow motion.
- Drum compensation and tracking shift in trick play mode (slow, still, frame advance, etc.).
- Amplification of record control signal.
- Others.

Below discussed are the names and functions of the pins of RH-IX0431GEZZ.

Pin No.	Name	Input/Output	Function
1	Vcc (for Analog circuit)	——	Power input terminal for analog amplifier (5 ± 0.5V).
2	Bias (+) (VREF (+))	Input	Reference bias voltage (2.5 V) settomg for analog amplifier and analog switch. Internally connected to the voltage follower input composed of C-MOS amplifier. 2.5 V reference voltage fed.
3	Bias (−) (VREF (−))	Output	Voltage follower output of the reference voltage fed at bias (+) (pin ②). Bias voltage of each amplifier inside the IC also connected to this pin.
4	Drum PG	Input	Negative drum phase generator pulse input. Threshold voltage is -70 mVp-p (TYP). Hysteresis is 60 mVp-p (TYP). (Positive square wave generated by the internal Schmitt amplifier)
5	Drum FG AMP	Input	Inverted input for inversion C-MOS amplifier of drum frequency generator. Bias preset at pin ② connected to this pin.
6	Drum FG AMP output	Output	Output terminal for inversion C-MOS amplifier of drum frequency generator.
7	Drum FG input	Input	Drum frequency generator Schmitt amplifier input terminal. Threshold voltage is 80 mVp-p (TYP). Hysteresis is 80 mVp-p (TYP).
8	Drum additional AMP output	Output	Additional amplifier output terminal for drum rotational control (C-MOS).
9	Drum additional AMP negative input	Input	Additional amplifier negative input terminal for drum rotational control (C-MOS).

Pin No.	Name	Input/Output	Function
10	Drum additional AMP positive input	Input	Addtional amplifier positive input terminal for drum rotational control (C-MOS).
11	Capstan FG input	Input	Capstan frequency generator Schmitt amplifier input terminal. Both threshold voltage and hysteresis are 80 mVp-p (TYP).
12	Capstan additional AMP output	Output	Additional amplifier output terminal for capstan rotational control (C-MOS).
13	Analog SW2	——	Built-in analog switch turns on at the servo serial data D18 = "1" and off at D18 = "0". Internally connected with capstan additional amplifier output to control the additional amplifier gain and to short-circuit the phase compensating capacitor. Slow, still, FF/REW and capstan stop modes brought on at D18 = "1".
14	Capstan additional AMP negative input	Input	Additional amplifier negative input terminalfor capstan rotational control (C-MOS).
15	Capstan additional AMP positive input	Input	Additional amplifier positive input terminal for capstan rotational control (C-MOS). (capstan speed and phase error voltages fed in)
16	GND (for Digital Circuit)	——	Ground for digital signal processing.
17	Drum phase error output (drum AFC)	Output	Drum phase error pulse width modulation (PWM) output terminal. Output at PWM repeated frequency $fsc/2^6 \fallingdotseq 69$ kHz. PWM duty stretched toward "H" due to phase delay. • Drum phase PWM output fixed at 50% duty if the drum frequency generator input frequency comes without about ±5% of the specified frequency.
18	Drum speed error output (drum AFC)	Output	Drum speed error PWM output terminal. Output at PWM repeated frequency $fsc/2^6 \fallingdotseq 69$ kHz. PWM duty stretched toward "H" due to speed (rpm) delay.
19	Capstan phase error output (capstan APC)	Output	Capstan phase error PWM output terminal. Output at PWM repeated frequency $fsc/2^6 \fallingdotseq 69$ kHz. PWM duty stretched toward "H" due to phase delay. Each capstan phase PWM output fixed at 50% duty in the following cases: 1) Drum frequency generator frequency out of about ±10% of the specified frequency.

<table>
<tr><th>Pin No.</th><th>Name</th><th>Input/Output</th><th>Function</th></tr>
<tr><td></td><td></td><td></td><td>2) Capstan frequency generator frequency out of about ±5% of the specified frequency.
3) No control pulse.
4) In serial data input mode for FF/REW, slow, short rewind (ASB*REV).</td></tr>
<tr><td>20</td><td>Analog SW 1</td><td>Output</td><td>Built-in analog switch turns on at the servo serial data D18 = "1" and off at D18 = "0". Bias voltage fed out of pin ③ when the switch turns on. Slow, still, FF/REW and capstan stop modes brought on at D18 = "1".</td></tr>
<tr><td>21</td><td>Capstan spped error output (capstan AFC)</td><td>Output</td><td>Capstan speed error PWM output terminal. Output at PWM repeated frequency fsc/2^6≒69 kHz. PWM duty stretched toward "H" due to speed down.</td></tr>
<tr><td>22</td><td>fsc (4.43 MHz) input</td><td>Input</td><td>4.43 MHz sub-carrier input terminal (C-MOS). Minimum operating compensation level at over 200 mVp-p. Inverting amplifier built-in.</td></tr>
<tr><td>23</td><td>LP mode (H)</td><td>Output</td><td rowspan="2">Tape speed detection logic output terminals for LP and SP modes (C-MCS output).
<table><tr><th>Tape speed / Output terminal</th><th>LP</th><th>SP</th></tr><tr><td>LP (H) : PIN ㉓</td><td>H</td><td>L</td></tr><tr><td>SP (H) : PIN ㉔</td><td>L</td><td>H</td></tr></table></td></tr>
<tr><td>24</td><td>SP mode (H)</td><td>Output</td></tr>
<tr><td>25</td><td>Servo serial data input</td><td>Input</td><td rowspan="2">Servo LSI operation mode is set by these input terminals. 21-bit serial clock provided. Internal mode is set by identifying data bit "1" or "0"; data bit "1" and "0" at serial data with "H"and "L", respectively, at rising edge of serial clock. Serial transfer made with shift register. Internal transfer of 21-bit data made at serial data "H" at falling edge of serial clock. (See Servo Process Block Diagram (Fig. 3-19).)</td></tr>
<tr><td>26</td><td>Servo serial clock input</td><td>Input</td></tr>
<tr><td>27</td><td>PG mono-multi</td><td>Input</td><td>Mono-multi terminal for video/audio head switching pulse output timing. (Drum frequency generator and phase generator input signals, internally shaped into square wave, are used to generate phase generator mono-multi trigger pulse. By this pulse, the time constant of resistor and capacitor externally added is activated for time adjustment.)</td></tr>
</table>

Pin No.	Name	Input/Output	Function
28	Video H-SW-P output	Output	Video head switching pulse output terminal. 1. Double-azimuth 4-head switching: Video head switching pulse output timing in SP mode delayed by 2H (≒128 μsec.) compared to that in LP mode. (Actual video heads are set up by 2H difference.)
29	Hi-Fi H-SW-P output	Output	Hi-Fi head switching pulse output terminal. 1. 2-head switching: Head switching pulse output 90° behind the video head switching pulse. 2. Double-azimuth 4-head switching: Head switching pulse 60° behind the video head switching pulse. (Not used on the models of this series.)
30	Vertical sync. input	Input	Composite sync. input detected for vertical sync. by the internal logic. Vertical sync. is distinguished from horizontal sync. by the pulse width.
31	Tracking monitor output	Output	Internal tracking delay time point monitored for digital tracking. • Monitor output stretched toward "H" duty when tracking data (servo serial data D0 thru D5 — 6 bits — used) is raised. (The center value is 20.0 msec. inside the IC; 14.78 msec. at this pin, however.)
32	Control pulse duty detection output	Output	Control pulse duty identify output terminal. "L" level when control pulse "H" duty (time from positive pulse to negative pulse) is long (about 60%). "H" level when it is short (about 27.5%). Control pulse identify duty fixed at 40% (TYP) in the IC.
33	Control pulse Schmitt output	Output	Output terminal of the control signal that has been fed through Schmitt amplifier and converted into square wave. "H" level square wave made with positive pulse and "L" one with negative pulse. Internal control pulse square wave inverted and put out when tape travel is reversed.
34	Vcc (for Digital Circuit)	——	Supply voltage input terminal for digital circuit (5 ± 0.5 V).
35	$\overline{\text{TEST}}$	Input	"H" input to make the servo IC in TEST mode. Usually at "H" level.

<table>
<tr><th>Pin No.</th><th>Name</th><th>Input/Output</th><th>Function</th></tr>
<tr><td>36</td><td>Record control (−)</td><td>Output</td><td>Terminal to apply voltage to negative pole of control head in record mode.
(High impedance in playback mode)
• "L" level duty 27.5% at servo serial data D17="1" and 60% at D17="0".</td></tr>
<tr><td>37</td><td>Record control (+)</td><td>Output</td><td>Terminal to apply voltage to positive pole of control head in playback mode.
(High impedance in playback mode)
• "H" level duty 27.5% at servo serial data D17="1" and 60% at D17="0".</td></tr>
<tr><td>38</td><td>GND (for Analog Circuit)</td><td>——</td><td>Ground terminal for analog amplifier.</td></tr>
<tr><td>39</td><td>AMP (+)</td><td>Input</td><td>C-MOS amplifier positive input terminal. Pulled with 37 kΩ (TYP) up to bias voltage at pin ③ inside the IC.</td></tr>
<tr><td>40</td><td>AMP (−)</td><td>Input</td><td>C-MOS amplifier negative input terminal.</td></tr>
<tr><td>41</td><td>AMP output</td><td>Output</td><td>C-MOS amplifier output terminal.
C-MOS amplifier composed at pins ㊴ and ㊵.
(Not used)</td></tr>
<tr><td>42</td><td>Control pulse Schmitt input</td><td>Input</td><td>Control pulse Schmitt amplifier input. Threshold voltage of schmitt amplifier system is controlled by the servo serial data D19 "0", "1" and slow/still mode as shown below, and control pulse is given out from schmitt output (pin ㉝).
<table>
<tr><th>Mode / Spec</th><th>D19 "0"</th><th>D19 "1"</th><th>Slow/still</th></tr>
<tr><td>Hysteresis</td><td>330mVp-p</td><td>650mVp-p</td><td>45mVp-p</td></tr>
<tr><td>Center level</td><td>0 mV</td><td>0 mV</td><td>110 mV</td></tr>
</table>
Notes:
1) The hysteresis of both the positive and negative pulses of control pulse are used at D19="0" or "1", in any other modes than slow/still.
In slow/still mode, only the positive pulse peak is detected.
2) D19="1" is in FF/REW and video search modes.
3) D19="0" is in the other modes than above.</td></tr>
</table>

3. SYSTEM CONTROLLER LSI

- 2-head system: RH-iX0448GEZZ, RH-iX0491GEZZ
- 4-head system: RH-iX0449GEZZ

3-1. System Controller Terminal Allocation.

I/O	Terminal Name	Name	No.		No.	Name	Terminal Name	I/O
	GND	Vss	64	RH-iX0448GEZZ, RH-iX0491GEZZ, RH-iX0449GEZZ	1	INT3	PB CTL	Input
Output	LOADING FWD CTL	P90	63		2	INT2	VISS IN	Input
Output	LOADING RVS CTL	P91	62		3	INT1	H.SW.P	Input
Output	BRAKE SOLENOID	P92	61		4	INT0	NC	Input
Output	CTL GAIN SW	P93	60		5	PTH3	CAM SW	(A/D) in
Input	DEW SENSOR	P80	59		6	PTH2	CASSETTE SW/REC TIP	(A/D) in
Input	REEL SENSOR	P81	58		7	PTH1	AUTO FUNCTION	(A/D) in
Input	START SENSOR	P82	57		8	PTH0	SPEED DET	(A/D) in
Input	END SENSOR	P83	56		9	T10	NC	Input
Output	NC	P70	55		10	T11	SYNC DET	Input
Output	NC	P71	54		11	P23	H.AMP SW	Output
Output	NC	P72	53		12	P22	CHROMA ROTARY	Output
Output	(−) GND CTL	P73	52		13	P21	BEEP	Output
Output	NC	P60	51		14	P20	S.T READY (L)	Output
3-value	FV	P61	50		15	si	T.S DATA	Input
I/O	FV M.M	P62	49		16	so	S.T DATA	Output
I/O	SLOW TRK M.M	P63	48		17	sck	T.S CLOCK	Input
Input	CLOCK IN	X1	47		18	INT4	ENVELOPE DET	Input
Output	CLOCK OUT	X2	46		19	P123	POWER CTL (L)	Output
Input	ACL (L)	ACL	45		20	P122	EE (L)	Output
Output	FV CTL	P50	44		21	P121	AUDIO MUTE (L)	Output
Output	NC	P51	43		22	P120	ALPB (L)	Output
Output	NC	P52	42		23	P133	BIAS CTL (L)	Output
Output	NC	P53	41		24	P132	NC	Output
Output	NC	P40	40		25	P131	VCR (L)	Output
Output	SERVO S.DATA	P41	39		26	P130	SEARCH (L)	Output
Output	SERVO S.CLOCK	P42	38		27	P143	COUNTER F/R	Output
Output	NC	P43	37		28	P142	CAPSTAN RVS (H)	Output
Output	NC	P30	36		29	P141	CAPSTAN PU (L)	Output
3-value	DRUM SPEED UP	P31	35		30	P140	CAPSTAN UL (L)	Output
3-value	CAPSTAN SPEED UP	P32	34		31	N.C.	NC	
3-value	CURRENT LMT	P33	33		32	Vdd	AT 5V	

Figure 3-1. Bottom View

3-2. TERMINAL DESCRIPTION (2-/4-HEAD SYSTEM)

Pin No.	Control Signal	Specifications
1	PB CTL	Reference signal taking playback blue mute (1) Unless PB CTL rising edge can be detected during 120 msec. in PB mode, a blue mute request is taken to the timer IC. (2) Ref. signal for determining a time (61 ± 2 pulses) of "Viss signal writing" (3) Detection signal for identifying a recorded tape (tab broken cassette) in Full Auto function • A signal causing reverse torque generation at frame advance
2	VISS IN	This input is to detect cue signal in Viss mode. (1) "H" is inputted on cue recording section. (H to be 20 msec. min.) (2) By timer operation, Intro search (Interval search) and Index search are set. i) Setting of Intro search (Interval search) When the FF/REW key is pressed, it is shifted to Intro search. When the cue signal input "H" is detected during FF/REW mode, it comes to be PB mode during 7 sec. and is re-shifted to the FF/REW mode, continuing the cue signal input. ii) Release of Intro search (Interval search) When the mode is cleared by the timer, Intro search is released at once, continuing the current mode. When the mode key (STOP/FF/REW/PB/REC/SLOW/double speed key) is pressed during Intro search, the Intro search mode is released, allowing mode shifting. iii) Index search When the number of skips is set by Index search, the Viss signal is detected, and then it is transmitted to the timer IC by the system controller SIO.
3	H.SW.P.	Sensor input intended to detect the state of the drum to be rotated. (1) Head switching pulse to detect if the drum is running. (2) Drum remains running with drum speed-up at "Z" (high impedance) from loading start to unloading end. (3) If head switching pulse input stays in the state (2) above for 1.6 seconds, the head is stopped. It is the reference signal of FV output in trick mode (VSF/R, x 2, STILL/SLOW). (1) In trick mode, FV output is taken at the rising and trailing edges of HSW.P input (HSW.P). (2) A signal allowing start of frame advance.
4	NC	To be connected to Vdd or GND
5	CAM SW	
6	CASSETTE SW/REC TIP	This terminal has the A/D converting function of 6-resolution for analog voltage by the comparator (IC built-in) and D/A converter. (5 to 8)
7	AUTO FUNCTION	

Pin No.	Control Signal	Specifications
8	SPEED DET	Switches shown corresponding to A-F keys of D/A converting circuit

Key \ Input terminal	Mecha-posi. SW input	Speed detection input	Function selection input
A	CA SW	SP mode	Variable speed VS/Auto OFF
B	HF SW		Variable speed VS/Auto Repeat
C	FF SW	LP mode	Fixed VS/Auto OFF
D	LD SW		Fixed VS/Auto Repeat
E	PB SW		Not used
F	PU SW		Not used
ALL SW "OFF"	SW OFF mode		Not used

Auto Power OFF: Auto power OFF function
Auto Repeat: Auto repeat playback function

Table 3-1.

[Cassette controller SW]

Refer to cassette controller circuit. (Fig. 3-2)

SW \ Type	Cassette controller/Auto cassette controller	Specifications
A	Cassette controller SW (Insertion start detection)	ON: Cassette insertion start OFF: Other than above
B	Auto load SW (Cassette fit-in state detection)	ON: Cassette fit-in state OFF: Non-auto load cassette controller or cassette not fitted in
C	REC. Tip SW (Mis-erasing preventive tab detection)	ON: Preventive tab broken OFF: Preventive tab present
D	(CAS. Unit fit-in state detection)	• D-SW to be always "ON" at unit fit-in state • All SWs to be "OFF" without unit

Table 3-2.

D/A Converting circuit (Main body SW/CAM. SW/Function selecting SW/Cassette controller SW)

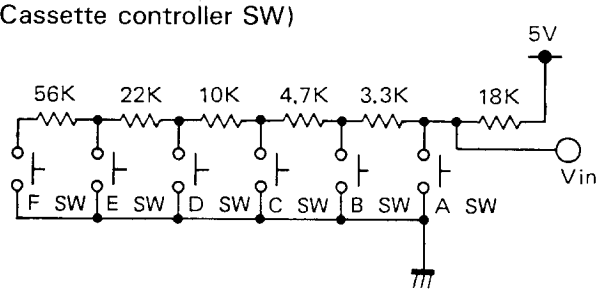
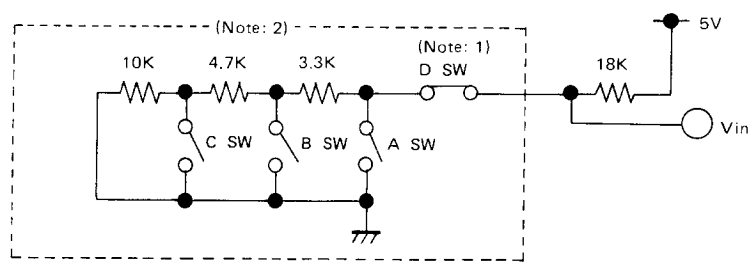


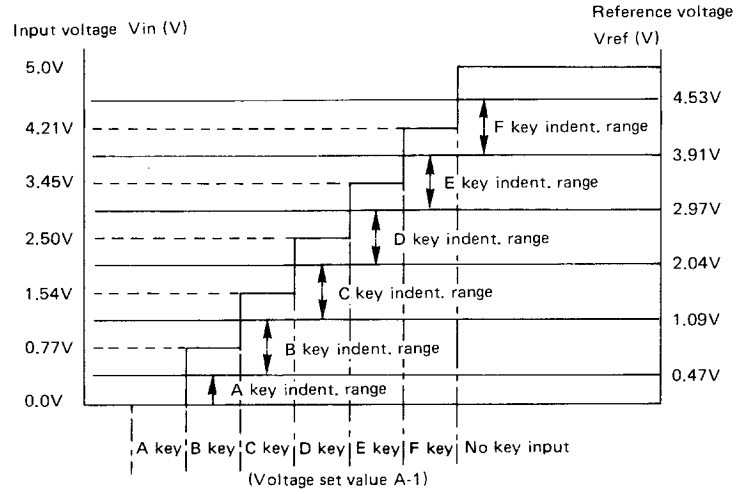
Figure 3-2 (a).



Note 1: The D switch is kept on all the time.
Note 2: The block framed with broken line is the cassette controller unit.

Figure 3-2 (b).

Pin No.	Control Signal	Specifications



Input voltage (Vin) VS. reference voltage (Vref) with each switch.

Figure 3-2 (c).

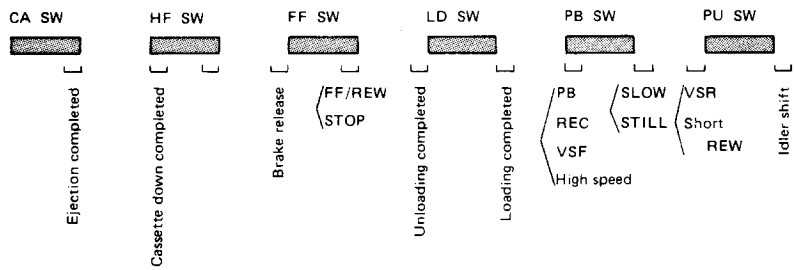


Figure 3-2 (d).

(CAM SW input)

- Refer to Fig. 3-2 for L-mecha. mecha-posi. and mode.

(Cassette control SW/REC Tip input)

- Timing of cassette insertion/Detection of REC. Tip state

(Cassette controller SW)

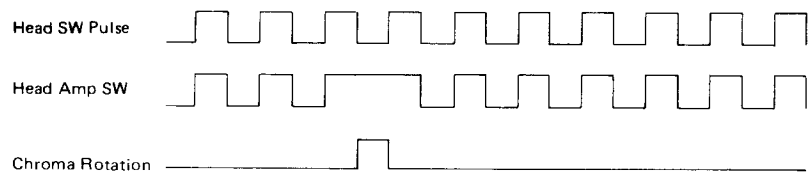
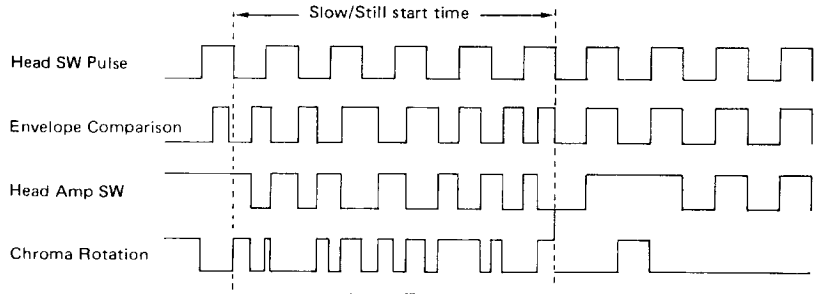
(1) SW A detects start of cassette insertion in slider UP condition.
(2) SW B is intended for Auto load cassette controller and "ON" when the cassette is fitted in slider UP condition.
For normal-type cassette controller, it is always "OFF".
(3) SW D is conceptual and always "ON" when the CAS. unit is fitted in.

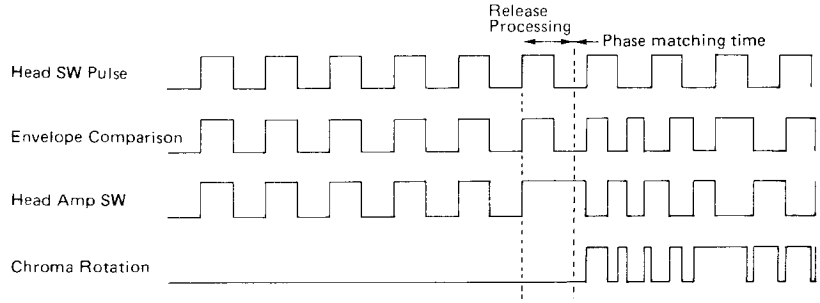
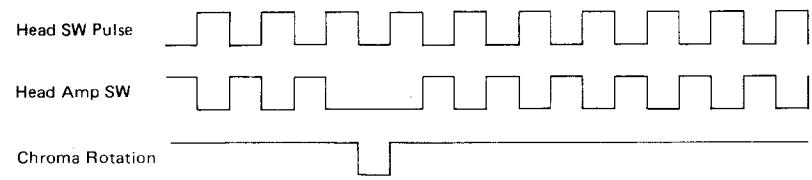
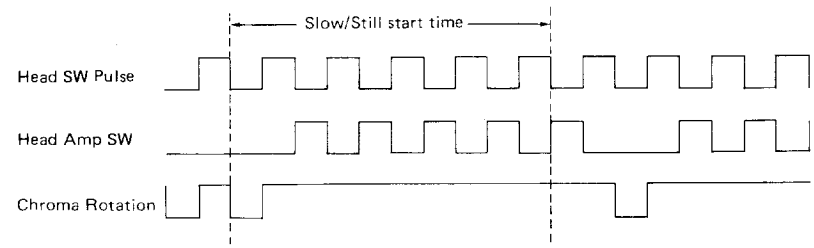
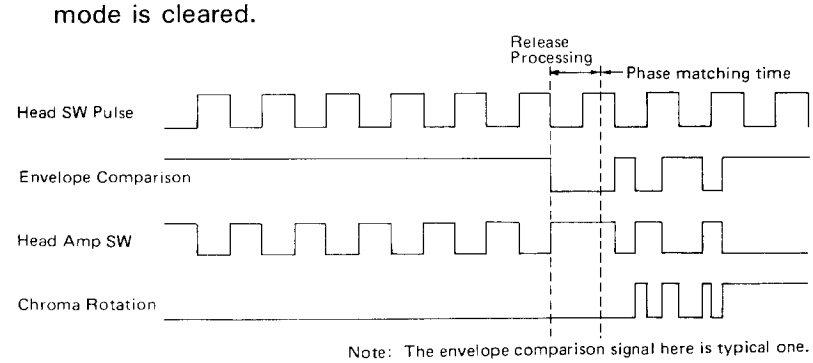
(REC Tip SW)

(1) It is "ON" at REC Tip broken and "OFF" at REC Tip present.
(2) It takes Eject immediately, if the "REC/timer REC" mode is to be started at REC Tip broken. (Tab-broken cassette/Auto-Eject function)

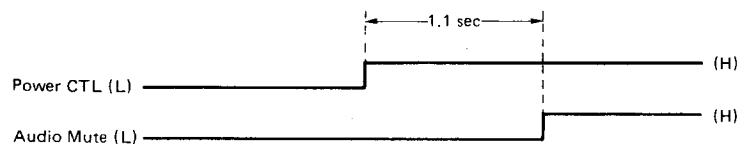
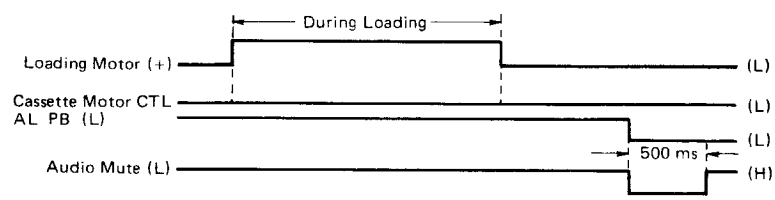
(Speed detection input)

Input to detect a tape speed data of 4H/2H
(1) Refer to the preceding para. of "A/D terminal description" for the relation between the recording mode and the voltage level to be inputted.
(2) The data inputted is transferred to the timer IC as below.

Pin No.	Control Signal	Specifications
		i) In Stop/REC mode, the data of speed detection input is made ineffective, and the data of recording mode selected by timer is made to be a serial signal, transferred and displayed. ii) At replay by PAL 2HEAD, the following codes are trasferred to the servo IC, instructed by "Audio 8CH spec. treatment" from the timer. • SP mode (Speed identification permitted) at Audio 8CH spec. treatment • SP fixed (Speed identification prohibited) at Audio 8CH spec. no-treatment
9	NC	To be connected to Vdd or GND
10	SYNC DET	It is an identifying terminal for weak electric field, being a signal to be outputted from the external Sync Det circuit for Hsync existence of input video signal. (1) For Hsync presence, it is weak electric field (L)="H". For Hsync not present, it is weak electric field (L)="L". (2) Input of weak electric field (L) is effective in case of EE (L)="L". (3) In case of EE (L)="L" (EE screen), if the weak electric field (L)="L" continues for 120 ms., it is to be a blue screen applied. (The timer IC takes OSD for application. However, that is only when the blue back ON/OFF SW is "ON".) (4) In Stop condition with PCON (L)="L", if the weak electric field (L)="L" continues for about 30 min., PCON (L)="H" is applied. (However, unless any execution instruction (T36) from timer IC is done, it is ineffective. At selection of Full Auto, T36="1".)
11	H. AMP SW (4-head: iX0449GE only)	Output to select between SP and LP heads. (1) SP mode: "H" LP mode: "L" (2) Head amplifier switching control signal at "L" in LP mode. (3) Inverted envelope comparison input signal (pin 18) to be outputted at VS-F/R in SP mode. (4) Signal to be outputted according to record mode of each step during slow/frame advance. **(SP mode)** • This signal remains in phase with head switching pulse during frame advance.  **Figure 3-3.** • This signal remains in anti-phase with envelope comparison signal at the start of slow/still mode.  Note: The envelope comparison signal here is typical one. **Figure 3-4.**

Pin No.	Control Signal	Specifications
		• The envelope comparison signal is inverted after the slow/still mode is cleared.  Note: The envelope comparison signal here is typical one. **Figure 3-5.** **(LP mode)** • This signal remains in anti-phase with head switching pulse during frame advance.  **Figure 3-6.** • The following timing is set up at the start of slow/still mode.  **Figure 3-7.** • The envelope comparison signal is inverted after the slow/still mode is cleared.  Note: The envelope comparison signal here is typical one. **Figure 3-8.**
12	CHROMA ROTARY (4-head: iX0449GE only)	Terminal to select chroma. (1) Right channel: "H" (6° azimuth head side). (2) EXOR logic for head switching pulse and head amplifier switching signal.

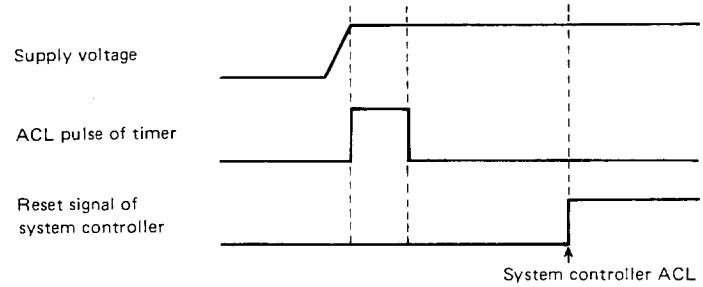
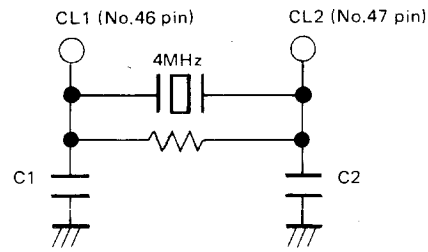
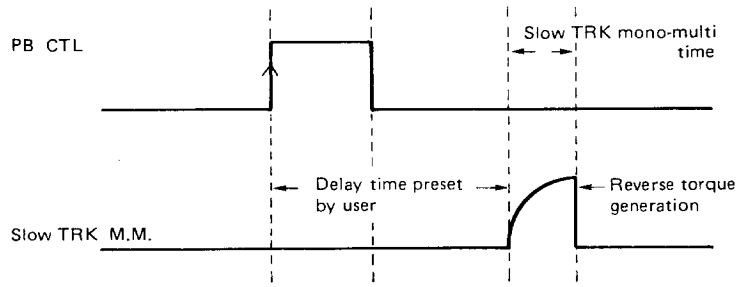
Pin No.	Control Signal	Specifications
13	BEEP	This output shows the time of confirmation sound output when the operating key is pressed. • Confirmation sound "ON time"="H" • Confirmation sound "OFF time"="L" **[System controller]** (1) The time of outputting a confirmation sound is 47 msec. (2) The timing of outputting a confirmation sound is to be at receiving of keys below. • Power key • REC key • TV/VCR key • Pause key • Eject key • REW key • Stop key • Slow key • FF key • Double speed key • PB key • At Viss writing (optional writing) **[Timer]** (However, the confirmation sound output is only when the timer serial data takes buzzer request.) (1) The time of outputting a confirmation sound is 47 msec. and 1 sec. (2) To output the 47 msec. confirmation sound, it is done when 47 msec. short sound buzzer 1 is present with the timer serial data. (Refer to the timer ref. material for the operating key outputting a short sound buzzer request.) • For the time of confirmation sound, it is shorter than the above value at Slow/Still.
14	S.T READY (L)	Refer to Page 44.
15	T.S DATA	It is a control signal intended for serial transfer between the timer IC and the system controller IC. (1) It should be timer READY (L)="L" every 23.4 msec., and 8 bit x 5 byte transferring is taken. (2) For serial transfer, after timer READY (L)="L" has been made, the system controller serial data is set by trailing edge of serial clock from timer IC, and the timer serial data is inputted by rising edge of serial clock. And then, after input of 8 bit data, it should be timer READY (L)="H". (3) The time of timer READY (L)="H" is 1.3 msec. min. (4) For serial data, refer to page 43.
16	S.T DATA	
17	T.S CLOCK	
18	ENVELOPE DET (2-head: iX0449GE only)	Reference signal for head amplifier/chroma rotary switching output. To be given out of the head amplifier module. (1) Used to control the head amplifier/chroma rotary switching output with the envelope comparison signal input as reference in each mode.
19	POWER CTL (L)	A signal to control the power (supply) (controlling a driving-system power) (1) When the Power key is pressed at Power "OFF", it should be PCON (L)="L". However, in case of timer stand-by, the Power key should be ineffective.

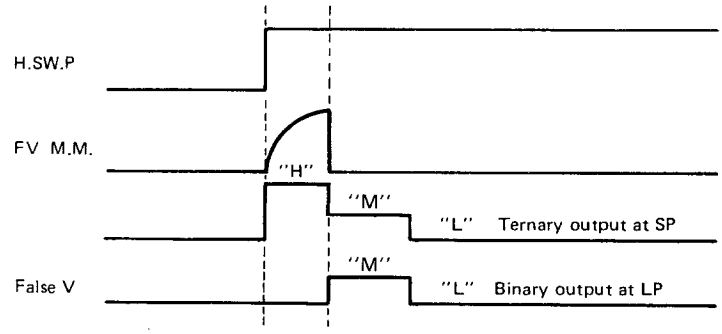
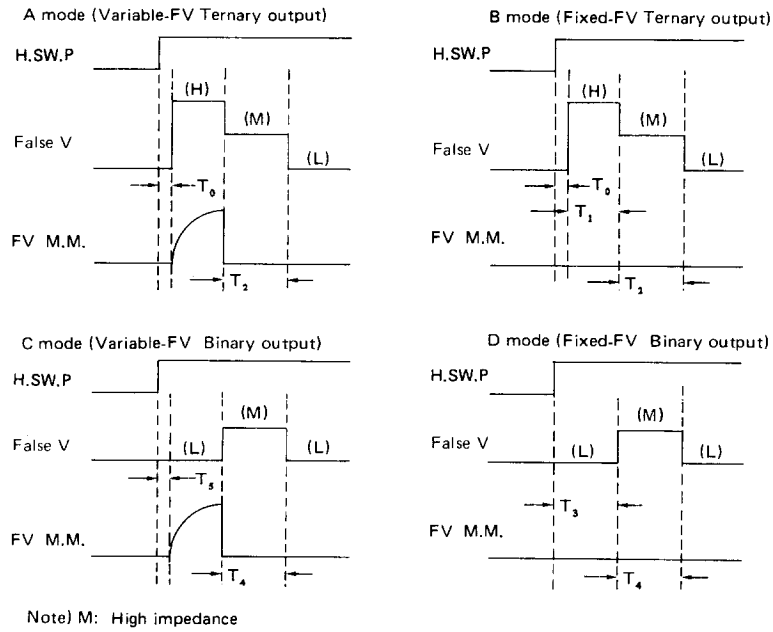
Pin No.	Control Signal	Specifications
		(2) When the Power key is pressed in ON mode, it should be PCON (L)="H". However, during mecha-operation, PCON (L)="L" is continued, and PCON (L)="H" is applied at the next mecha-position. • Stop position • Slider Up position (3) At timer stand-by, if the timer start data of timer serial data is detected, it should be PCON (L)="L", making REC display. (Timer recording start) (4) At timer stand-by, it should be PCON (L)="H". However, in VPS Interrupt mode, PCON (L)="L" is applied. (5) For driving of loading motor, cassette motor or capstan motor, if PCON (L)="H" is present, it should be made PCON (L)="L", and after driving, it is made PCON (L)="H". (6) In case of EE (L)="L" and PCON (L)="L", if weak electric field (L) input="L" continues for 30 min., it is automatically to be PCON (L)="H", allowing the mis-power-OFF preventive function to be effected.
20	EE (L)	A signal of selecting between EE screen and playback screen (1) The EE signal is intended to select the signal, i.e. the video/audio output is to be EE or PB, and thus in case of EE (L)="L" it selects to the signal (EE screen) to be transmitted from the tuner, and also at EE (L)="L" it selects to the signal (PB screen) to be transmitted from the video head. (2) At PB. REC position, if it is PB-system mode and EE (L)="L", EE (L)="H" is applied about 1 sec. after positive turn of capstan motor. (3) If the PB-system mode is released, it should be EE (L)="L".
21	AUDIO MUTE (L)	A signal to stop any audio output (1) At Power CTL (L)="H", it should be Audio mute (L)="L" at any time. (2) For Power "ON":  **Figure 3-9.** (3) After PB loading end:  **Figure 3-10.**

Pin No.	Control Signal	Specifications
		(4) In PB mode, when the trick playback (Still, Slow, VSF, VSR & double speed) key is turned "ON", A mute (L)="L" is applied immediately, shifting to trick playback. (5) When trick playback is released, it is moved to the mecha-posi. of PB mode, and then after about 1,000 ms, A mute (L)="H" is applied. (6) When the PB mode is released with EE (L)="H" condition, A mute (L) should be ="L" for 500 msec.
22	AL PB (L)	A signal to select REC mode with PB mode (1) In case of PB-system mode (PB, Still, Slow, VS-F/R, double speed) at PB. REC position, AL PB (L)="L" is applied. (2) When the PB-system mode is released, it should be AL PB (L)="H".
23	BIAS CTL (L)	A signal to control start/end of recording of video/audio signal
24	NC	Not used.
25	VCR (L)	Control signal to switch on and off the signal to come to the RF converter. (1) Signal from the video tuner or playback signal from the video tape fed in with VCR (L) signal at "L". (2) Antenna input (VHF) signal fed through in with VCR (L) signal at "H". (3) VCR (L) signal at "H" with power control (L) signal at "H". (4) With power control (L) signal at "L", the TV/VCR selector key switches VCR (L) signal: • From "H" to "L". • From "L" to "H". (5) When the Stop key is pressed during playback mode, the following are obtained. i) If the VTR mode (L)="L" at output of playback screen, VTR mode (L)="L" is continued. ii) If the VTR mode (L)="H" at output of playback screen, VTR mode (L)="H" is continued.
26	SEARCH (L)	It is a control signal for selecting the gain of PB CTL signal. (1) In Video-Search F/R mode, it should be Search (L)="L".
27	COUNTER F/R	It is a control signal offering the tape running direction to the timer IC. (1) Counter CTL="H" : Reverse turn Counter CTL="L" : Positive turn (2) Other than the model below should be identical to the capstan motor direction. Namely, in case of capstan reverse turn="H", counter CTL="H" is applied. • Cue sound countermeasures for FF/REW-Stop, etc. (Idler neck swing) • Idler neck swing • Inversion brake time for VS release (3) In the mode below, the following are to be taken to adjust to the tape running direction. (For use of real time counter) • At loading ..... Counter CTL="L" • Eject position/Stop position ..... Counter CTL="L"

<table>
<tr><th>Pin No.</th><th>Control Signal</th><th>Specifications</th></tr>
<tr><td>28</td><td>CAPSTAN RVS (H)</td><td>It is a control signal for determining the rotating direction of capstan motor.
(1) The mode is made by combining the terminal ㉞ with forced acceleration.
<table>
<tr><th>Control signal / Mode</th><th>Forced acceleration</th><th>Capstan motor reverse turn</th></tr>
<tr><td>Capstan motor stop</td><td>L</td><td>L</td></tr>
<tr><td>Capstan motor positive turn</td><td>H</td><td>L</td></tr>
<tr><td>Capstan motor reverse turn</td><td>H</td><td>H</td></tr>
</table>
Figure 3-3.</td></tr>
<tr><td>29</td><td>CAPSTAN PU (L)</td><td>A signal to control a reel rotating torque
(1) The capstan PU is a signal for controlling the torque control voltage of capstan motor, and outputs at the following timing.
i) At transfer from PB. REC posi. to VSR posi.
ii) At return from VSR posi. to PB/REC posi.
iii) At idler move (Neck swing processing)
iv) Idler move from tape-winding upon cassette insertion
v) Idler move at REC—REC. Pause</td></tr>
<tr><td>30</td><td>CAPSTAN UL (L)</td><td>A signal to control a reel rotating torque
(1) The capstan UL is a torque control voltage to be applied to the capstan motor, and to be "L" during unloading, at start of FF/REW or at tape-winding at Eject.
i) If the Stop/FF/REW mode is obtained at PB. REC position, the loading motor is reversely turned, and after about 500 msec., capstan UL (L)="L" is made, and the capstan motor is reversely turned, stopping the capstan motor and capstan UL (L)="H" at brake release position.
ii) When the FF key is pressed at FF. REW position, FF display is made, and after brake release, capstan UL (L)="L" is made, and the capstan motor is positive-turned and about 500 msec. later, capstan UL (L)="H" is applied.
iii) When the REW key is pressed at FF. REC position, REW display is made, and after brake release, capstan UL (L)="H" is made, and the capstan motor is reversely turned and about 500 msec. later, capstan UL (L)="H" is applied.
(2) In tape slack detection or leader tape-winding processing, for start of tape running, about 500 msec. capstan UL (L)="L" is to be applied. However, if the above processing is completed within 500 ms., capstan UL (L)="H" is made immediately.
(3) Idler move at start of loading action.
(4) Loose-tape winding processing upon cassette insertion (300 msec.)
(5) Loose-tape winding processing during Eject actuation.
(6) Countermeasure for tape slack at FF→Stop</td></tr>
<tr><td>31</td><td>NC</td><td>NC Terminal</td></tr>
<tr><td>32</td><td>AT 5V</td><td>Vdd terminal</td></tr>
</table>

Pin No.	Control Signal	Specifications
33	CURRENT LMT	It is an output offering a torque (current) limit to the capstan motor. (1) In case of Power CTL (L)="L", current limit="L" is outputted. (2) For Power CTL (L)="L": i) At Still (still image) replay→Current limit="Z" ii) At Slow/Frame advance→Refer to frame advance timing chart. iii) For other than above, current limit="H" is outputted.
34	CAPSTAN SPEED UP (Forced acceleration)	It is an output accelerating (stopping) the rotation speed to the capstan motor. (1) For Slow/Still: i) At Still (still image) replay→Forced acceleration="H" ii) At Slow/Frame advance→Refer to a frame advance timing chart. 2) Other than Slow/Still i) Capstan motor rotation: Forced acceleration="Z" ii) Capstan motor stop: Forced acceleration="L"
35	DRUM SPEED UP	This signal is to control the drum motor rotation, and stops the drum motor in case of drum mute (L)="L". (1) If PB, VSR, VSF, Still, Slow, double speed or REC display is obtained at FF/REW position, drum mute (L)="Z" is applied, and after 500 ms, loading is started. (2) If Stop, FF or REW is obtained at PB/REC position, unloading is started, and after completion, drum mute (L)="L" is applied. (3) Lateral swing acceleration at Slow/Still→Refer to a frame advance timing chart.
36	NC	NC terminal NC Terminal should be open.
37	NC	NC terminal NC terminal should be open.
38	SERVO S. CLOCK	(1) The following are the method of data transfer to servo IC. The servo IC outputs the data of 21 bits to latch the servo/display serial data at rising edge of servo/display serial clock. Then, the serial output is completed by making servo/display serial data="H" at the final clock trailing edge. (2) For mode and data, refer to page 43.
39	SERVO S. DATA	
40	NC	NC terminal NC terminal should be open.
41	NC	Mode display IC output strobe signal (not used).
42	NC	NC terminal NC terminal should be open.
43	NC	NC terminal NC terminal should be open.
44	FV CTL	It is a control signal for APC correction of drum in trick mode. (1) In case of trick="H", drum correction is done. (2) At VS-F/R, double speed, slow & Still mode, trick="H" is made. (3) The timing of trick="L" is to be 1 sec. after phasing term after PB mode shifting.

Pin No.	Control Signal	Specifications
45	ACL (L)	It is an initial resetting terminal of microcomputer, and allows the microcomputer to be initial-reset by applying the low voltage. In addition, with system controller reset signal, initial resetting is possible by connecting such a signal to the ACL terminal by the timer microcomputer. The timing of system controller reset signal on timer microcomputer is shown Fig. 3-11.  **Figure 3-11.**
46 47	CLOCK OUT CLOCK IN	The system clock generating circuit of microcomputer is built in, and the clock signal (4 MHz) is obtained by connecting the ceramic resonator shown Fig. 3-12.  **Figure 3-12.**
48	SLOW TRK M.M	It is intended to adjust the reverse torque generating timing at Slow/Frame advance. The preset is inputted to this terminal. (1) Normally, "L" is outputted. (2) At frame advance, when it detects the rising edge of PBCTL signal, it allows the delay time preset by user to pass by. Then, the terminal is selected to "Z" (High impedance) and such a mono-multi input started. When recognized as "H", the mono-multi input is stopped and the terminal to be "L".  **Figure 3-13.**

Pin No.	Control Signal	Specifications
49	FV M.M	It is intended to adjust the delay amount from the edge of H.SW.P to the generation of false vertical synchronous signal. (1) Normally, "L" is outputted. (2) After detection of H.SW.P edge, the terminal is made to be "Z" (High impedance) and the mono-multi input taken. When recognized as "H", the mono-multi input is stopped and the terminal to be "L".  **Figure 3-14.**
50	FV	In trick mode (VS-F/R), it generates FV/FH and applies the synchronization. (1) Such a FV is generated in VS-F/R mode, mecha. shift time of PB→VS-R, mecha. shift time at VS-R release, mode holding time of VS-F/R release Slow/Still, and in the case of Head 2 giving no double speed. (2) The generation timing waveform is as shown below. (Note: H.SW.P applies to both rising and trailing.)  Note) M: High impedance **Figure 3-15.**

<table>
<tr><th>Pin No.</th><th>Control Signal</th><th>Specifications</th></tr>
<tr><td></td><td></td><td>(3) Modes and output waveforms are listed below
<table>
<tr><th rowspan="2">Mode</th><th rowspan="2">Recording Mode</th><th colspan="2">Head SW Pulse</th></tr>
<tr><th>Rising</th><th>Trailing</th></tr>
<tr><td rowspan="3">VS-Forward/Reverse</td><td>2-head (SP)</td><td>D mode</td><td>D mode</td></tr>
<tr><td rowspan="2">4-head (SP)
(LP)</td><td>B mode</td><td>B mode</td></tr>
<tr><td>D mode</td><td>D mode</td></tr>
<tr><td rowspan="3">Still/Slow</td><td>2-head (SP)</td><td>D mode</td><td>C mode</td></tr>
<tr><td rowspan="2">4-head (SP)
(LP)</td><td>A mode</td><td>B mode</td></tr>
<tr><td>D mode</td><td>C mode</td></tr>
<tr><td rowspan="3">Double Speed</td><td>2-head (SP)</td><td>D mode</td><td>C mode</td></tr>
<tr><td rowspan="2">4-head (SP)
(LP)</td><td>B mode</td><td>A mode</td></tr>
<tr><td>D mode</td><td>C mode</td></tr>
</table>
Table 3-4.</td></tr>
<tr><td>51</td><td>NC</td><td>NC terminals: Terminal processing should be open.</td></tr>
<tr><td>52</td><td>⊖ GND CTL</td><td>It controls the (−) terminal of CTL head.
(1) 100 ms after bias CTL (L)="L", it should be GND CTL="L". (At REC)
(2) It should be bias CTL (H)="H", together with GND CTL="H".
(3) Normally, it should be "H".</td></tr>
<tr><td>53</td><td>NC</td><td>NC Terminal: Terminal processing is to be open.</td></tr>
<tr><td>54</td><td>NC</td><td>NC terminal: Terminal processing is to be open.</td></tr>
<tr><td>55</td><td>NC</td><td>NC terminal: Terminal processing is to be open.</td></tr>
<tr><td>56</td><td>END SENSOR</td><td>A signal to detect a tape end
(1) For detection of rising edge of end sensor input:
i) In case of ON mode with cassette IN, auto-rewinding is taken.
ii) During timer REC, Eject is taken after leader tape winding.
(2) If in Stop mode, the tape is rewound and the leader tape wound until the end sensor input is "L". However, unless the end sensor input is "L" even after continuous rewinding for 5 sec., stop processing is taken.
(3) Cassette-down is judged by the end sensor input and the next start sensor input as follows:
(Cassette controller down). ($\overline{\text{End sensor}}$) + ($\overline{\text{Start sensor}}$))="H"
In such a case, cassette-down is recognized.</td></tr>
<tr><td>57</td><td>START SENSOR</td><td>A signal to detect a tape start
(1) For detection of rising edge of start sensor input:
i) In case of REW mode, stop processing is taken.
ii) If during REC/PAUSE short rewinding, short rewinding is interrupted.
(2) If is Stop mode, the tape is rapidly advanced and the leader tape wound until the start sensor input is "L". However, unless the start sensor input is "L" regardless of continous rapid-advance for 5 sec., stop processing is taken.
(3) The start sensor input is utilized for cassette-down recognition. Refer to the paragraph of end sensor input.</td></tr>
</table>

<table>
<tr><th>Pin No.</th><th>Control Signal</th><th>Specifications</th></tr>
<tr><td>58</td><td>REEL SENSOR</td><td>It is a sensor input intended to detect the reel stand situation when it is to be turned.
(1) The situation subject to a reel stand turn is as follows:
i) For loading completion:
• PB
• REC
• VSF
• VSR
• Double-speed
ii) For unloading completion:
• FF
• REW
(2) In such conditions, unless the reel sensor input changes within the time of each mode shown below, stop processing is taken.
<table><tr><th>Mode</th><th>Shut-Off Time</th></tr><tr><td>SP-PB/SP-REC/FF/REW/Double-speed/1.5-time speed</td><td>5.0 sec.</td></tr><tr><td>LP-PB/LP-REC</td><td>10.0 sec.</td></tr><tr><td>Video Search Rewind/Video Search Reverse</td><td>1.2 sec.</td></tr></table>Table 3-5.
(3) For processing of tape slack detection, the edge of reel pulse to be inputted utilizing the reel sensor is to be counted.</td></tr>
<tr><td>59</td><td>DEW SENSOR</td><td>An input terminal to detect any dew situation
(1) When the dew sensor is equal to "H", it identifies as dew situation and prohibits any mecha. actuation. However, the following keys should be effective regardless of dew situation.
• Power
• Eject/Insertion
• TV/VTR
(2) When the dew sensor is equal to "H", the mecha. position is moved to Eject position and done as follows:
PCON (L)="L" ..... Drum mute (L)="H"
PCON (L)="H" ..... Drum mute (L)="L"
(3) When the dew sensor is equal to "L", the mecha. position is moved to Stop position.</td></tr>
<tr><td>60</td><td>CTL GAIN SW</td><td>It is a gain selecting output of PB-CTL amp. at FF/REW.
(1) At FF/REW→CTL gain selecting
CTL="H" output
Other than above→CTL gain selecting
CTL="L" output</td></tr>
<tr><td>61</td><td>BRAKE SOLENOID</td><td>It is a signal for controlling the brake solenoid ON/OFF.
(1) This signal is intended to control the brake solenoid ON/OFF, and in case of brake solenoid="H", the brake solenoid is made to be attracted.
(2) When the REW key is pressed at FF.REW position, REW display is made, and it makes loading motor positive-turn CTL="L" and loading motor reverseturn="H", and after movement to brake release posi., brake solenoid="H" is applied.
(3) When the FF key is pressed at FF.REW position, FF display is made and then the same brake release processing as (2) is taken.</td></tr>
</table>

<table>
<tr><th>Pin No.</th><th>Control Signal</th><th>Specifications</th></tr>
<tr><td></td><td></td><td>(4) If the cassette is already inserted and end sensor="H" or start sensor="H" is present, the same brake release processing as (2) is taken.
(5) In tape slack detection, it takes such a brake release processing identical to (2).
(6) When the REW key is pressed in case of EE (L)="H" at PB.REC posi., VSR display is made and brake solenoid="H" made, shifting to the VSR position. After shifting, brake solenoid="L" is applied.
Then, when the VSR mode is released, it makes brake solenoid="H" after stopping of tape running, and then upon shifting to PB.REC position, brake solenoid="H" is made.
(7) In the item of (2), (3) and (4) of capstan UL, brake solenoid="L" is made immediately before capstan UL (L)="H".
(8) It makes brake solenoid="L" immediately before release of FF/REW.</td></tr>
<tr><td>62</td><td>LOADING RVS CTL</td><td>(1) It is an output terminal for controlling the rotating direction of loading motor.</td></tr>
<tr><td>63</td><td>LOADING FWD CTL</td><td>Given below is the relevant combination.
<table>
<tr><th>Control Signal / Mode</th><th>Loading motor positive-turn CTL</th><th>Loading motor reverse-turn CTL</th></tr>
<tr><td>Loading motor Stop</td><td>L</td><td>L</td></tr>
<tr><td>Loading motor positive-turn</td><td>H</td><td>L</td></tr>
<tr><td>Loading motor reverse-tur</td><td>H</td><td>H</td></tr>
</table>
Table 3-6.
(2) For stopping condition of mecha. actuation:
• Loading motor positive-turn CTL="L"
• Loading motor reverse-turn CTL="L"
(3) The following functions are provided so as to prevent any overcurrent to the loading motor.
• 2.0 sec. shut-off at cassette controller actuation
• 7.0 sec. shut-off at loading arm actuation
(4) For shut-off, there should be loading motor positive-turn CTL="L" and loading motor reverse-turn CTL="L", and the loading motor is stopped, and then stoppage is continued at that position until the operating key input has any change.
However, if during positive-turn of cassette controller, the motor is reversely turned and the cassette is ejected at once.
(5) Actuation of cassette controller
i) In cassette insertion, unless the cassette controller moves to the cassette controller down-posi. within 2 sec., it is actuated in Eject direction immediately, and further if not moved to the cassette controller up-posi. within 2 sec., it takes shut-off.
ii) For cassette controller Eject, unless the cassette controller moves to the cassette controller up-posi. within 2 sec., it is actuated in the cassette inserting direction, and if not moved to the cassette controller down-posi. within 2 sec., it takes shut-off.</td></tr>
<tr><td>64</td><td>GND</td><td>Vss terminal (GND)
To be connected to GND</td></tr>
</table>

3-3. Data Transmission Specification of Mechanism Controller Corresponding to Serial Mode Servo

- Data is transmitted with the following format.

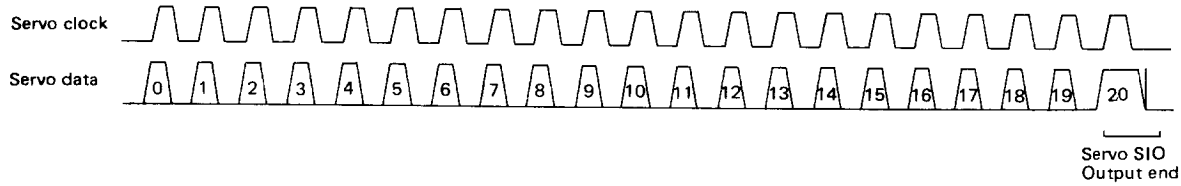


Figure 3-16.

(1) 21 bit data is outputted to the servo IC through the 2-line system consisting of servo clock (SCK) and servo data (SI).
(2) The servo data latches at the tail edge of servo clock. Servo SIO ends when the servo data is set to "H" at the servo clock tail.

1. Relation between Modes and Service Data

(The servo IC corresponds to RH-IX0431GEZZ)

Mode	Serial Data																
	0~5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
POWER OFF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Serial transmission stop
POWER ON STOP	*1)	1	1	0	1	1	0	0	1	*2)		1	0	1	0	0	(FF2)
For 2.0S after FF start	*1)	1	1	0	1	1	0	0	0	*2)		1	0	0	1	0	(FF1)
FF subsequent	*1)	1	1	0	1	1	0	0	1	*2)		1	0	0	1	0	(FF2)
For 2.0S after REW start	*1)	1	1	1	1	1	0	0	0	*2)		1	0	0	1	0	(REW1)
REW subsequent	*1)	1	1	1	1	1	0	0	1	*2)		1	0	0	1	0	(REW2)
PB SP mode	*1)	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	(PB)
LP mode	*1)	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	(PB)
SP fixed mode	*1)	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	(PB)
VSF (M)	*1)	1	1	0	1	0	0	0	0	*2)		1	0	0	1	0	(SER2) SP: *5, LP: *5
(H)	*1)	1	1	0	1	0	0	1	0	*2)		1	0	0	1	0	(SER3) SP: *7, LP: *7
VSR (M)	*1)	1	1	1	1	0	0	0	0	*2)		1	0	0	1	0	(SER2/R) SP: *5, LP: *5
(H)	*1)	1	1	1	1	0	0	1	0	*2)		1	0	0	1	0	(SER3/R) SP: *7, LP: *7
SLOW	*1)	1	1	0	1	1	1	0	0	1	1	1	0	1	0	0	(SLOW)
STILL	*1)	1	1	0	0	0	0	0	0	1	1	1	0	1	0	0	(SLOW)
High speed	*1)	1	1	0	0	1	1	0	0	*2)		1	0	0	0	0	(*2)
REC SP mode	*1)	0	0	0	0	0	0	0	0	1	0	1	*3)	0	0	0	(REC)
LP mode	*1)	0	0	0	0	0	0	0	0	0	1	1	*3)	0	0	0	(REC)
SP fixed mode	*1)	0	0	0	0	0	0	0	0	0	0	1	*3)	0	0	0	(REC)
REC/pause	*1)	0	1	0	0	0	0	0	0	*2)		1	0	1	0	0	(REC · ASB)
Loading	*1)	0	1	0	0	0	0	0	0	*2)		1	0	1	0	0	(REC · ASB)
Unloading	*1)	1	1	0	1	1	0	0	1	*2)		1	0	0	0	0	(FF2)
Short loading	*1)	1	1	0	1	0	0	0	0	*2)		1	0	0	1	0	(SER1) / (*2)
Short unloading	*1)	1	1	0	0	0	0	0	0	*2)		1	0	1	0	0	(PB)
Trick cancel	*1)	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	(PB)
Short rewinding	*1)	0	1	0	0	0	0	0	0	*2)		1	0	0	0	0	(REC · ASB)
Phase matching	*1)	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	(REC · ASB)

Note *1 : Tracking delay time
D0 to D5 = "1 0 0 0 0 0" only in REC mode
In other modes the preceding data remains.

Note *2 : SP : 1 0
LP : 0 1
SP fixed : 0 0
Holding : 1 1

Note *3 : Only when writing the VISS signal: "1"
In other cases: "0"

Table 3-7.

2. Serial data D0 to D5

Serial Data						Tracking Delay time (msec)
0	1	2	3	4	5	
0	0	0	0	0	0	5.22
		↓				↓
0	1	1	1	0	1	18.62
		↓				↓
1	0	0	0	0	0	20.00
		↓				↓
1	1	1	0	1	0	32.01
		↓				↓
1	1	1	1	1	1	34.32

Note: The output from pin (31) of the servo IC (RH-IX0431GEZZ) is delayed by 5.22 msec.

Table 3-8.

3. Serial data D14 to D15

Serial Data		Speed Data
14	15	
1	0	SP
0	1	LP
0	0	SP fixed
1	1	Holding

Table 3-9.

4. Serial data D16 to D20

D16	Head Selection
0	D/A 4 Head
1	2 Head

D17	REC / DUTY Selection
0	REC · CTL 27.5%
1	REC · CTL 60 %

D18	CAP / SERVO SW
0	ANALOG SW ON
1	ANALOG SW OFF

D19	Hysteresis Width
0	300mVpp
1	600mVpp

D20	REC / CTL Selection
0	High-Z
1	GND

Table 3-10.

3-4. Serial Transmission Format between System Controller and Timer

1. Format of Data Transmitted from System Controller to Timer

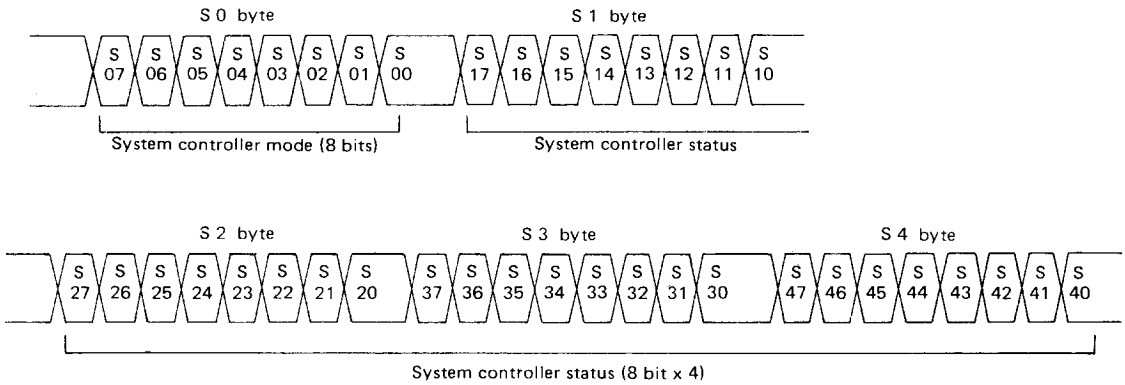

S 0 byte
S 1 byte
S 07 S 06 S 05 S 04 S 03 S 02 S 01 S 00
S 17 S 16 S 15 S 14 S 13 S 12 S 11 S 10
System controller mode (8 bits)
System controller status
S 2 byte
S 3 byte
S 4 byte
S 27 S 26 S 25 S 24 S 23 S 22 S 21 S 20
S 37 S 36 S 35 S 34 S 33 S 32 S 31 S 30
S 47 S 46 S 45 S 44 S 43 S 42 S 41 S 40
System controller status (8 bit x 4)

Figure 3-17.

(1) 5-byte data is transmitted by one transmission sequence.
(2) The S0 byte is arranged so that 8 bits compose one system controller mode data.
(3) The system controller mode is the system controller operation modes.
(4) The S1, S2, S3 and S4 bytes are 8 bite data which are used as system controller status data.
(5) The content of system controller status is represented the status of pertinent sensor by each bit.
(6) The timer makes the data valid when the same data is received twice successively (for S0, S1, S2, S3, S4).

2. Format of Data Transmitted from Timer to System Controller

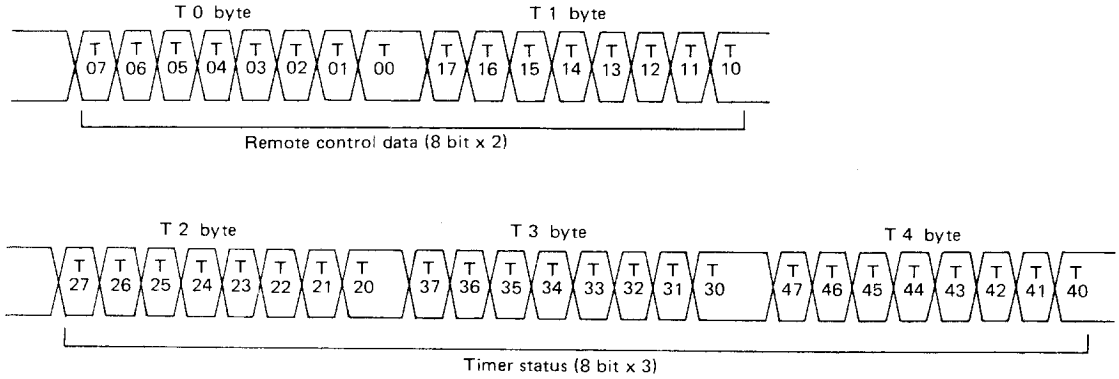
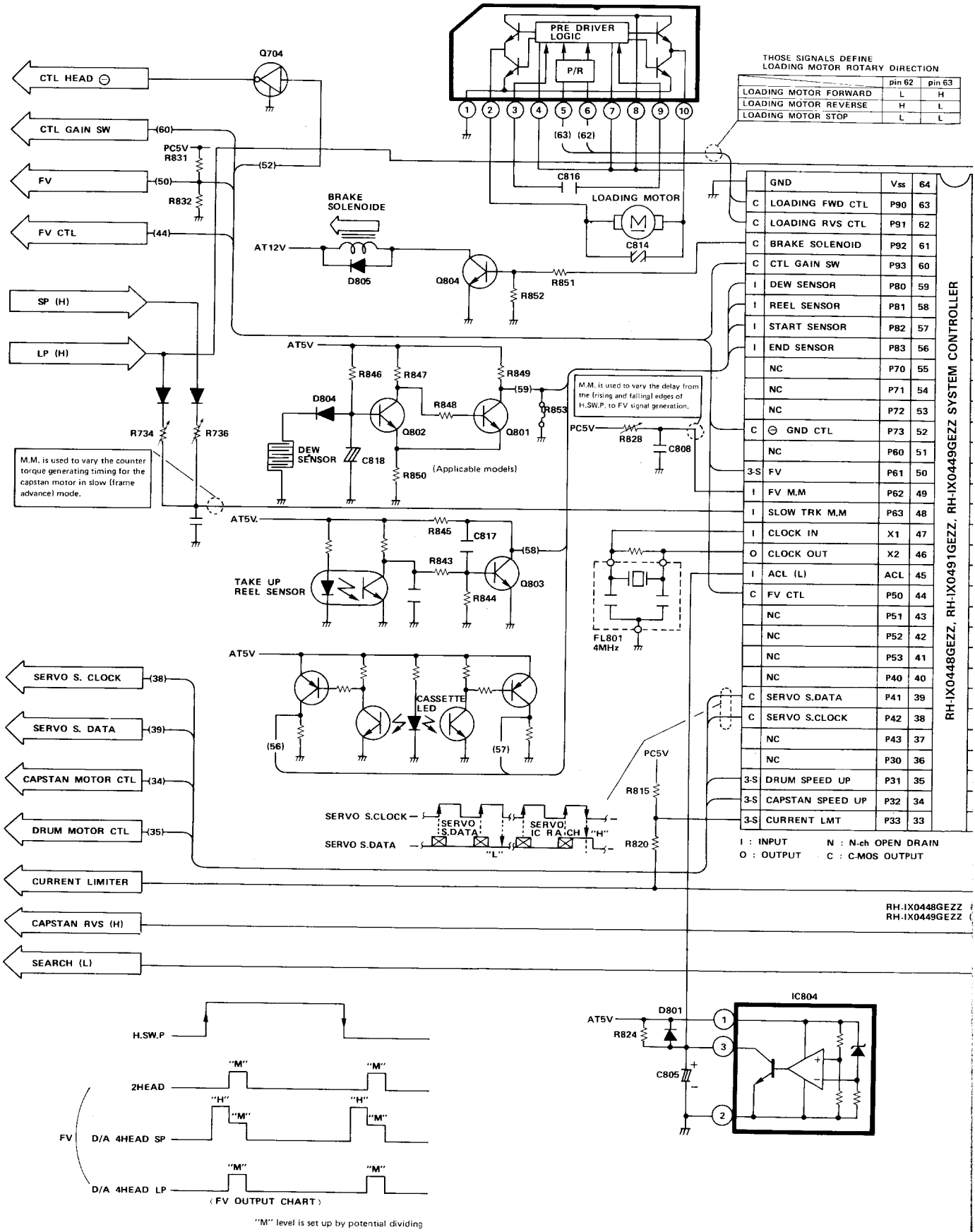

T 0 byte
T 1 byte
T 07 T 06 T 05 T 04 T 03 T 02 T 01 T 00 T 17 T 16 T 15 T 14 T 13 T 12 T 11 T 10
Remote control data (8 bit x 2)
T 2 byte
T 3 byte
T 4 byte
T 27 T 26 T 25 T 24 T 23 T 22 T 21 T 20 T 37 T 36 T 35 T 34 T 33 T 32 T 31 T 30 T 47 T 46 T 45 T 44 T 43 T 42 T 41 T 40
Timer status (8 bit x 3)

Figure 3-18.

(1) 5-byte data is transmitted by one transmission sequence.
(2) T0 byte and T1 byte are 8 bit data which are used as remote control data.
(3) The remote control data and they are determined by the content of control signals from the optical remote control and timer.
(4) The T0 byte and T1 byte have always the same data content.
(5) The system controller makes the remote control data valid if the T0 byte and T1 byte match with each other.
(6) The T2, T3 and T4 bytes are time master status data. The timer status consists of 8-bit flag it represents the timer status.
(7) The system controller makes the timer status data valid when the same timer status data is received twice successively.

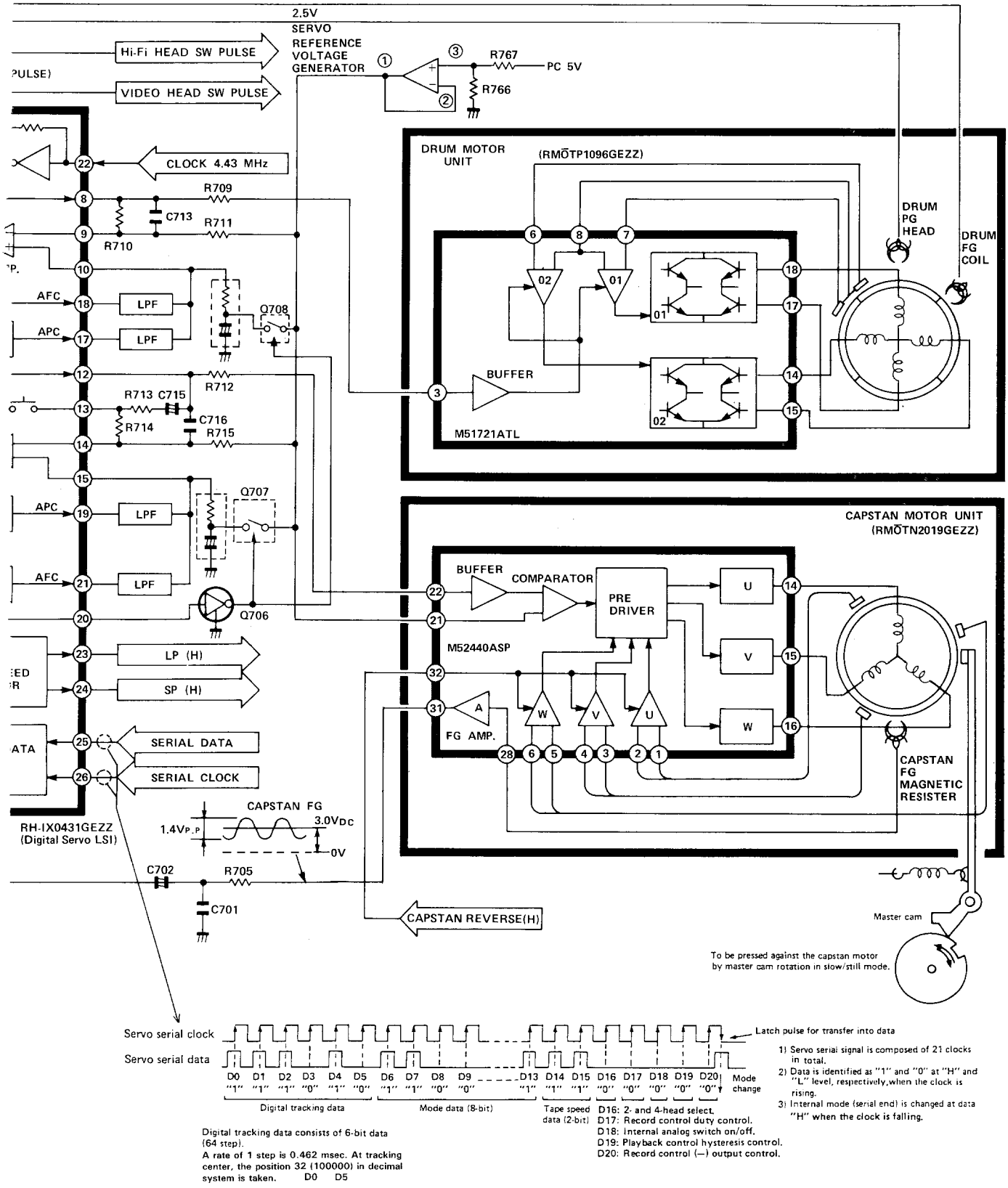
System Controller Block Diagram



	GND	Vss	64
C	LOADING FWD CTL	P90	63
C	LOADING RVS CTL	P91	62
C	BRAKE SOLENOID	P92	61
C	CTL GAIN SW	P93	60
I	DEW SENSOR	P80	59
I	REEL SENSOR	P81	58
I	START SENSOR	P82	57
I	END SENSOR	P83	56
	NC	P70	55
	NC	P71	54
	NC	P72	53
C	⊖ GND CTL	P73	52
	NC	P60	51
3-S	FV	P61	50
I	FV M.M	P62	49
I	SLOW TRK M.M	P63	48
I	CLOCK IN	X1	47
O	CLOCK OUT	X2	46
I	ACL (L)	ACL	45
C	FV CTL	P50	44
	NC	P51	43
	NC	P52	42
	NC	P53	41
	NC	P40	40
C	SERVO S.DATA	P41	39
C	SERVO S.CLOCK	P42	38
	NC	P43	37
	NC	P30	36
3-S	DRUM SPEED UP	P31	35
3-S	CAPSTAN SPEED UP	P32	34
3-S	CURRENT LMT	P33	33

"M" level is set up by potential dividing resistor with system controller output = Hi-Z.

Figure



Servo serial clock
Servo serial data
Latch pulse for transfer into data
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D13 D14 D15 D16 D17 D18 D19 D20
"1" "1" "1" "0" "1" "0" "1" "1" "0" "0" "1" "1" "1" "0" "0" "0" "0" "0"
Mode change
Digital tracking data
Mode data (8-bit)
Tape speed data (2-bit)

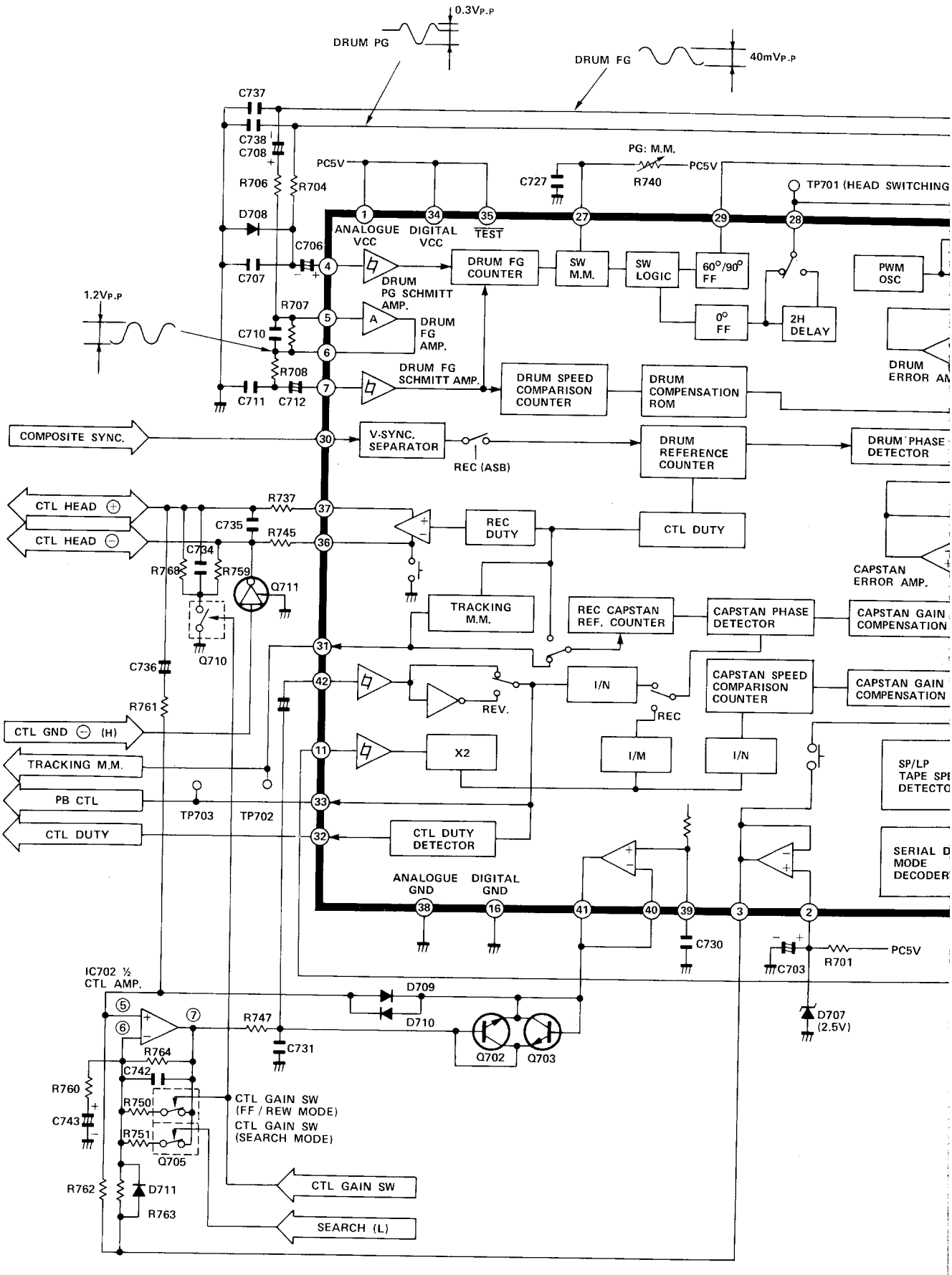
Digital tracking data consists of 6-bit data (64 step).
A rate of 1 step is 0.462 msec. At tracking center, the position 32 (100000) in decimal system is taken. D0 D5

D16: 2- and 4-head select.
D17: Record control duty control.
D18: Internal analog switch on/off.
D19: Playback control hysteresis control.
D20: Record control (—) output control.

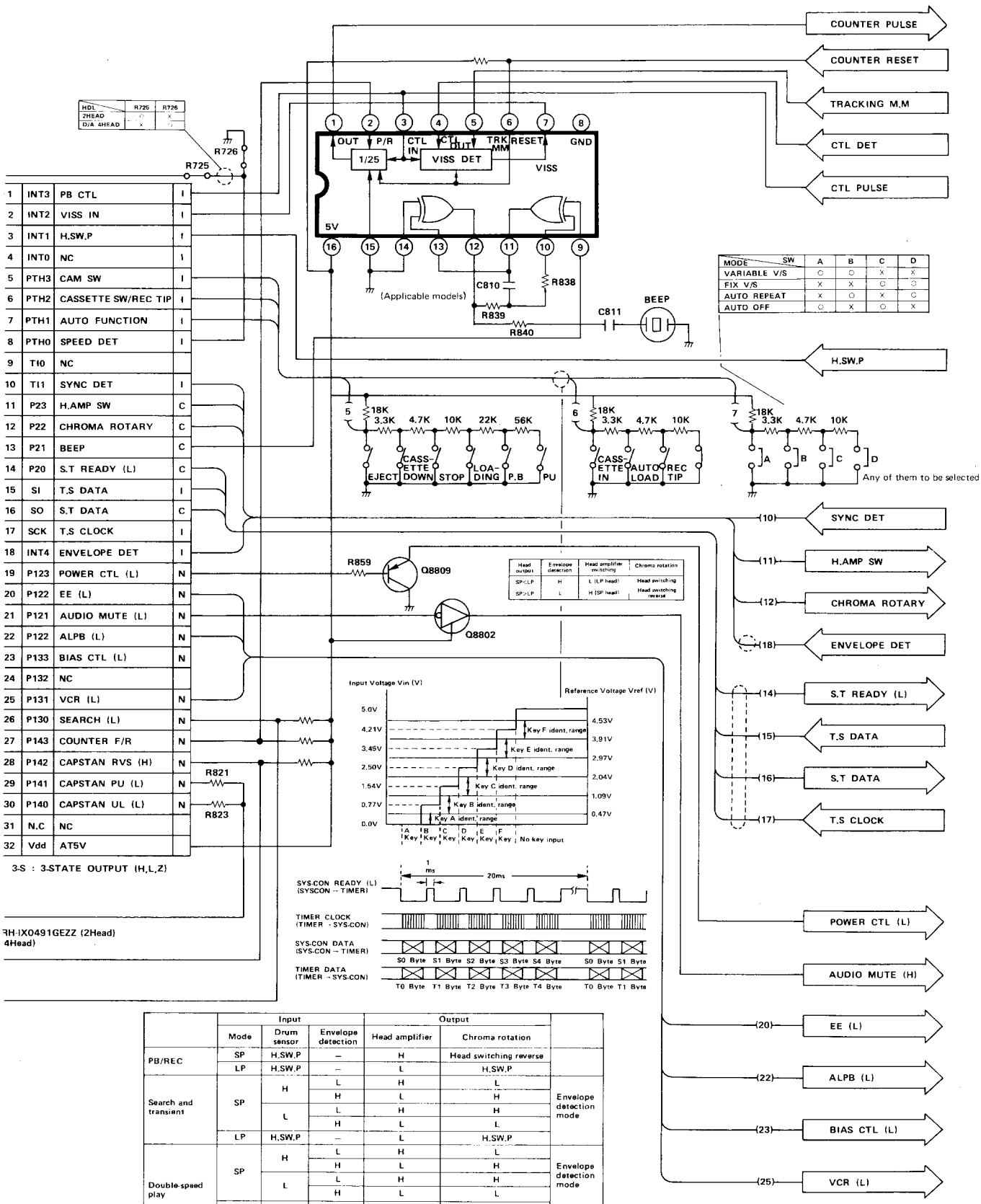
1) Servo serial signal is composed of 21 clocks in total.
2) Data is identified as "1" and "0" at "H" and "L" level, respectively, when the clock is rising.
3) Internal mode (serial end) is changed at data "H" when the clock is falling.

ure 3-19.

Servo Process Block Diagram



Figu



1	INT3	PB CTL	I
2	INT2	VISS IN	I
3	INT1	H.SW.P	I
4	INT0	NC	I
5	PTH3	CAM SW	I
6	PTH2	CASSETTE SW/REC TIP	I
7	PTH1	AUTO FUNCTION	I
8	PTH0	SPEED DET	I
9	TI0	NC	
10	TI1	SYNC DET	I
11	P23	H.AMP SW	C
12	P22	CHROMA ROTARY	C
13	P21	BEEP	C
14	P20	S.T READY (L)	C
15	SI	T.S DATA	I
16	SO	S.T DATA	C
17	SCK	T.S CLOCK	I
18	INT4	ENVELOPE DET	I
19	P123	POWER CTL (L)	N
20	P122	EE (L)	N
21	P121	AUDIO MUTE (L)	N
22	P122	ALPB (L)	N
23	P133	BIAS CTL (L)	N
24	P132	NC	
25	P131	VCR (L)	N
26	P130	SEARCH (L)	N
27	P143	COUNTER F/R	N
28	P142	CAPSTAN RVS (H)	N
29	P141	CAPSTAN PU (L)	N
30	P140	CAPSTAN UL (L)	N
31	N.C	NC	
32	Vdd	AT5V	

MODE \ SW	A	B	C	D
VARIABLE V/S	○	○	×	×
FIX V/S	×	×	○	○
AUTO REPEAT	×	○	×	○
AUTO OFF	○	×	○	×

	Input			Output		
	Mode	Drum sensor	Envelope detection	Head amplifier	Chroma rotation	
PB/REC	SP	H.SW.P	–	H	Head switching reverse	
	LP	H.SW.P	–	L	H.SW.P	
Search and transient	SP	H	L	H	L	Envelope detection mode
			H	L	H	
		L	L	H	H	
			H	L	L	
	LP	H.SW.P	–	L	H.SW.P	
Double-speed play	SP	H	L	H	L	Envelope detection mode
			H	L	H	
		L	L	H	H	
			H	L	L	
	LP	H.SW.P	–	Head switching reverse	H	LP-R and SP-R used
Slow/still	SP	H.SW.P	–	H.SW.P	L	LP-L and SP-L used
	LP	H.SW.P	–	Head switching reverse	H	LP-R and SP-R used

HEAD AMP. SWITCHING & CHROMA ROTATION TABLE

4. TIMING CHART

Slow/Still Frame Advance Timing Chart (2-head system)

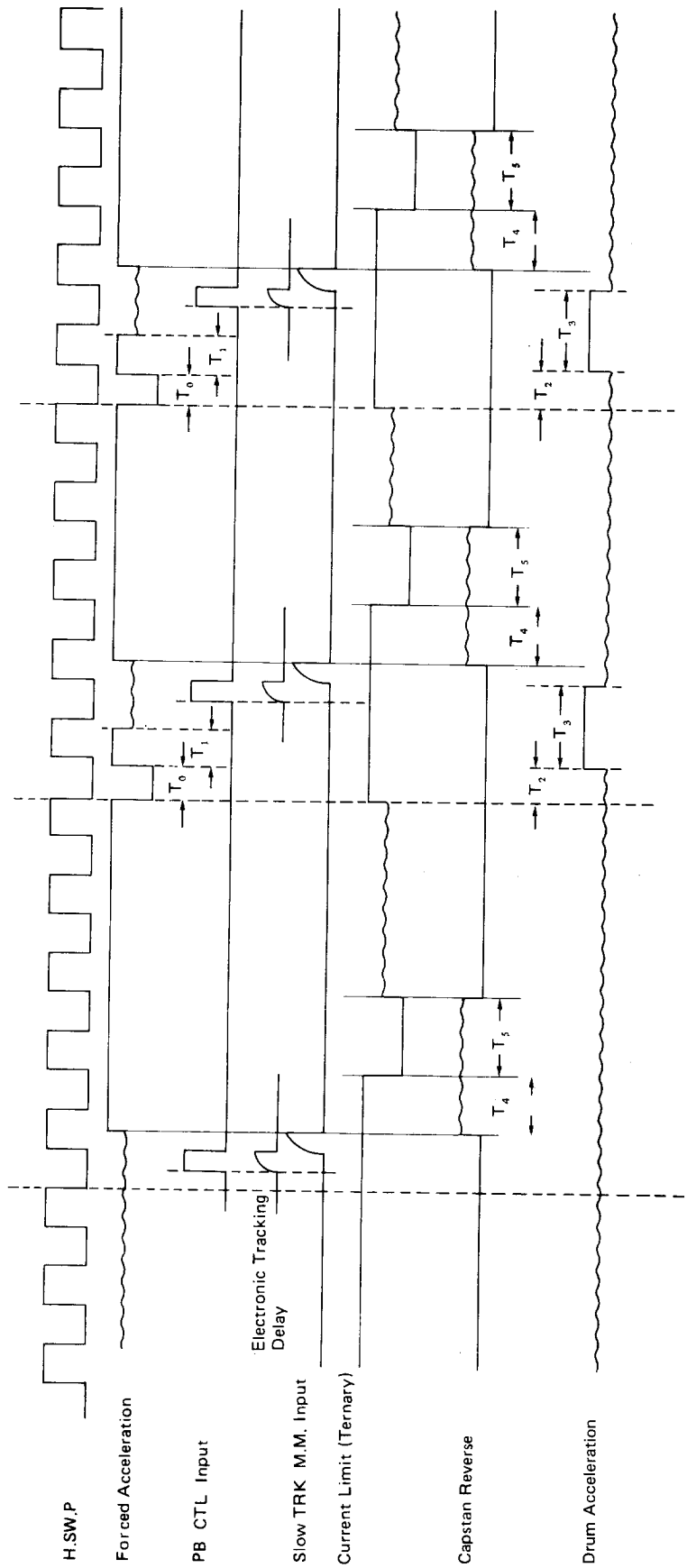


Figure 4-1.

Shift to REC/STOP mode when the Slow/Still mode is cleared (2-head system)

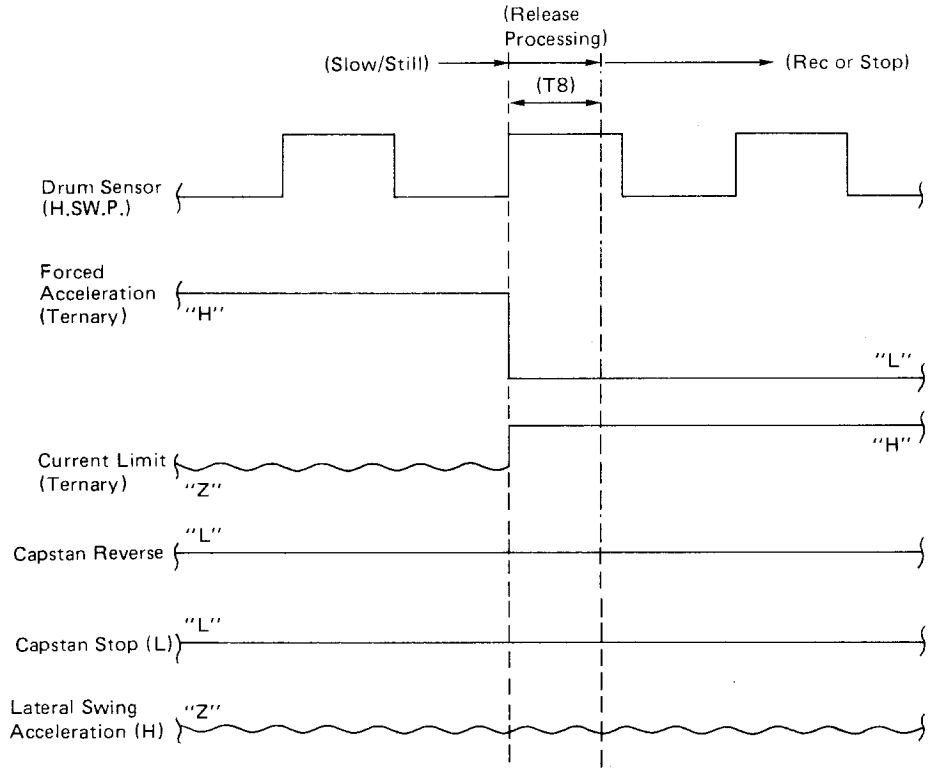


Figure 4-2.

Shift to PB mode when the Slow/Still mode is cleared (2-head system)

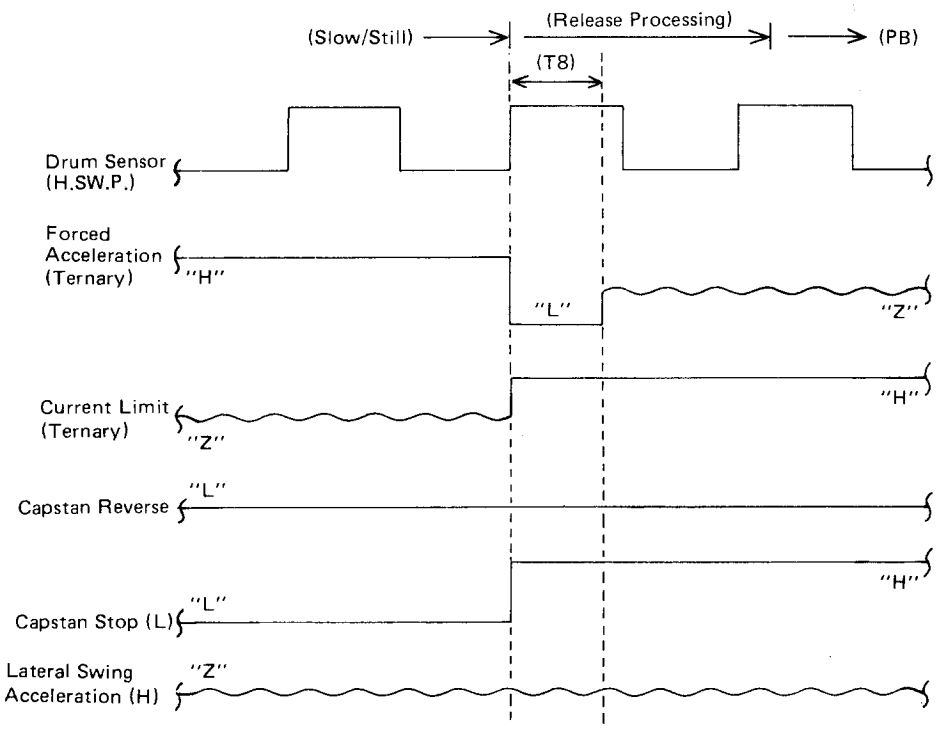


Figure 4-3.

Symbol		Item	Preset Value		
			SP	LP	
Frame Advancing	T0	Start M/M	13.8 ms	—	
	T1	Forced acceleration M/M	16.6 ms	—	
	T2	Lateral swing acceleration start time	18.7 ms	—	
	T3	Lateral swing acceleration M/M	45.8 ms	—	
	T4	Speed reduction M/M	12.0 ms	—	
	T5	Brake M/M	13.6 ms	—	
	T6	———	—	—	
	T7	———	—	—	
Release	T8	Forced acceleration release	23.0 ms	—	
	T9	———	—	—	

Note: Head 2 is special for SP; therefore, Slow/Still M/M, etc. of LP is under study.

Figure 4-1.

Slow/Still Frame Advance Timing Chart (4-head system)

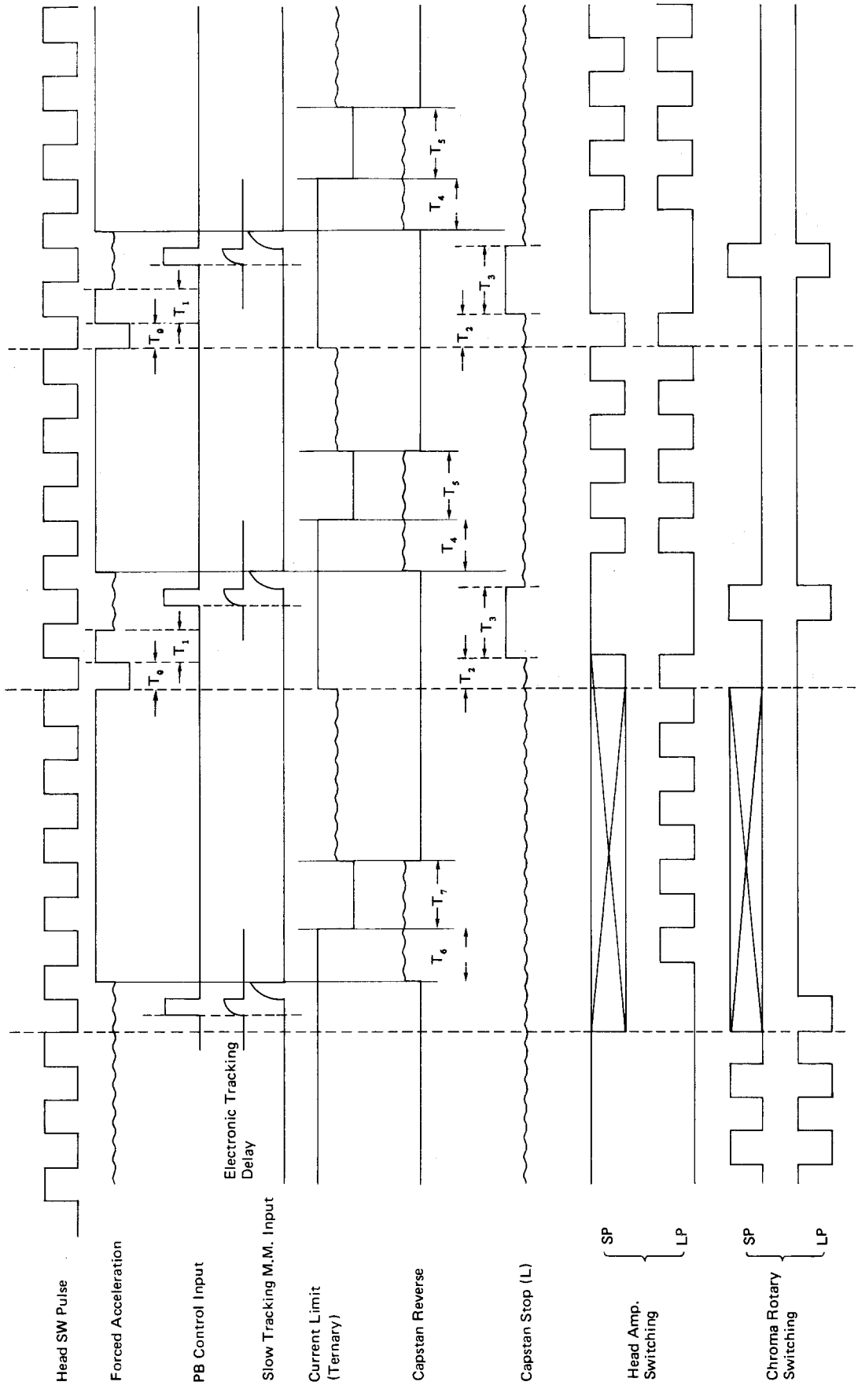


Figure 4-5.

Shift to PB mode when the SP Slow/Still mode is cleared (4-head system)

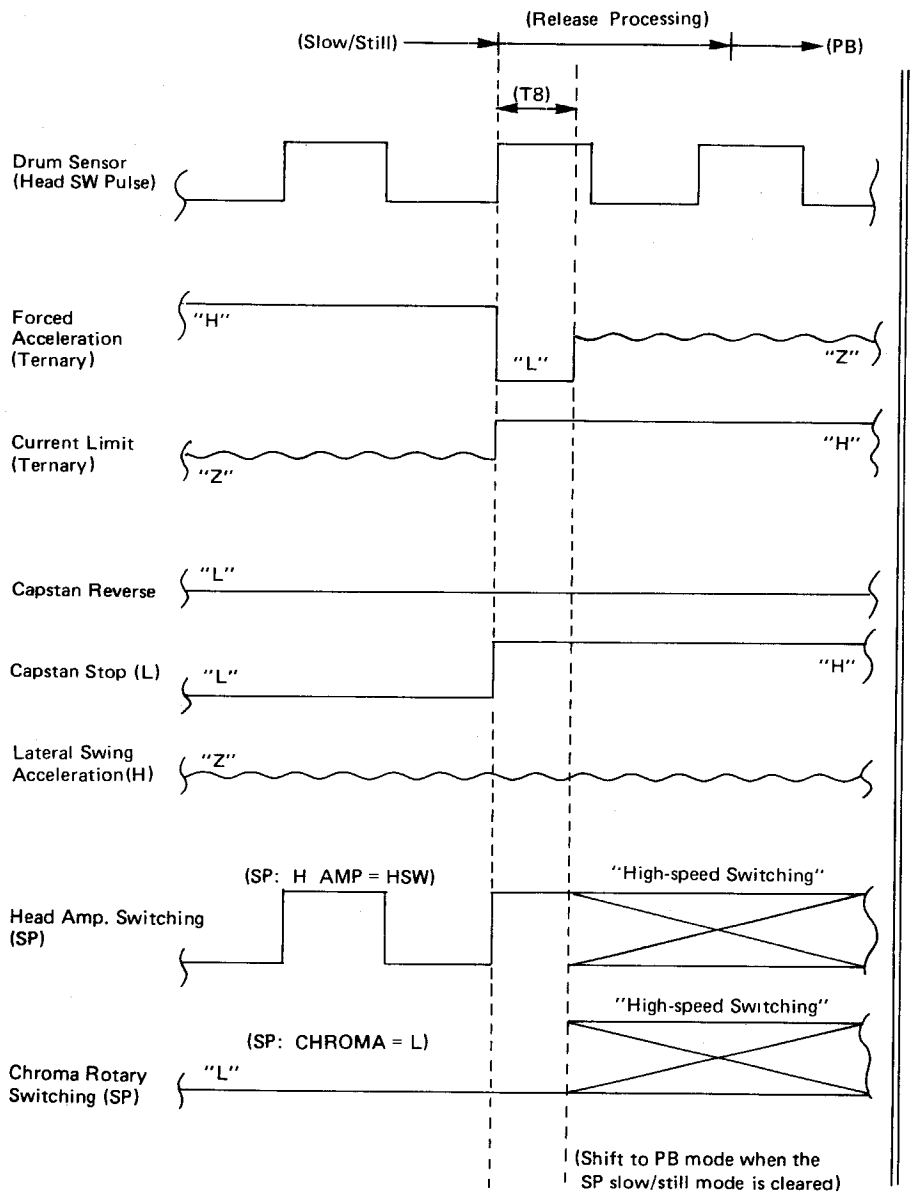


Figure 4-6.

Shift to PB mode when the LP Slow/Still mode is cleared (4-head system)

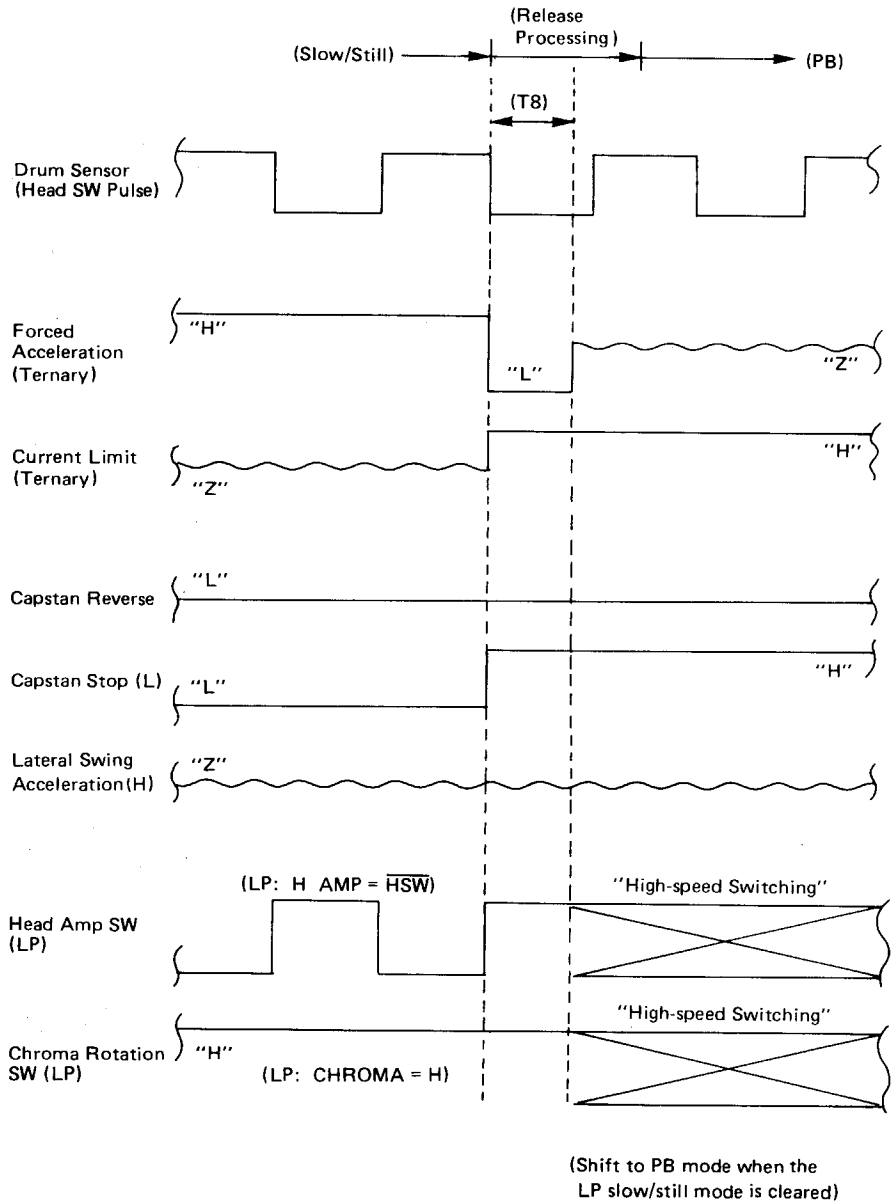


Figure 4-7.

Shift to REC/STOP mode when the SP Slow/Still mode is cleared (4-head system)

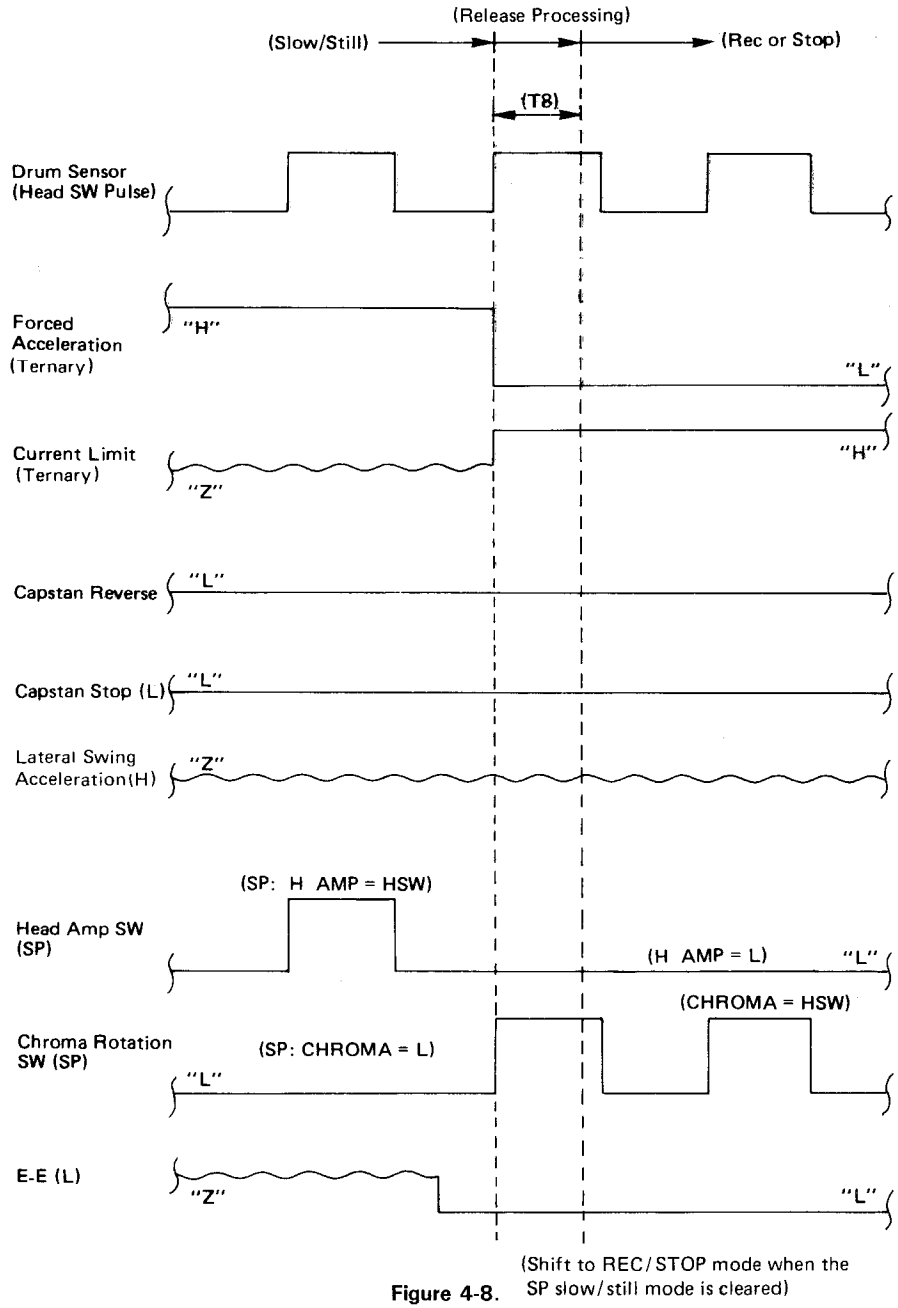


Figure 4-8.

Shift to REC/STOP mode when the SP Slow/Still mode is cleared (4-head system)

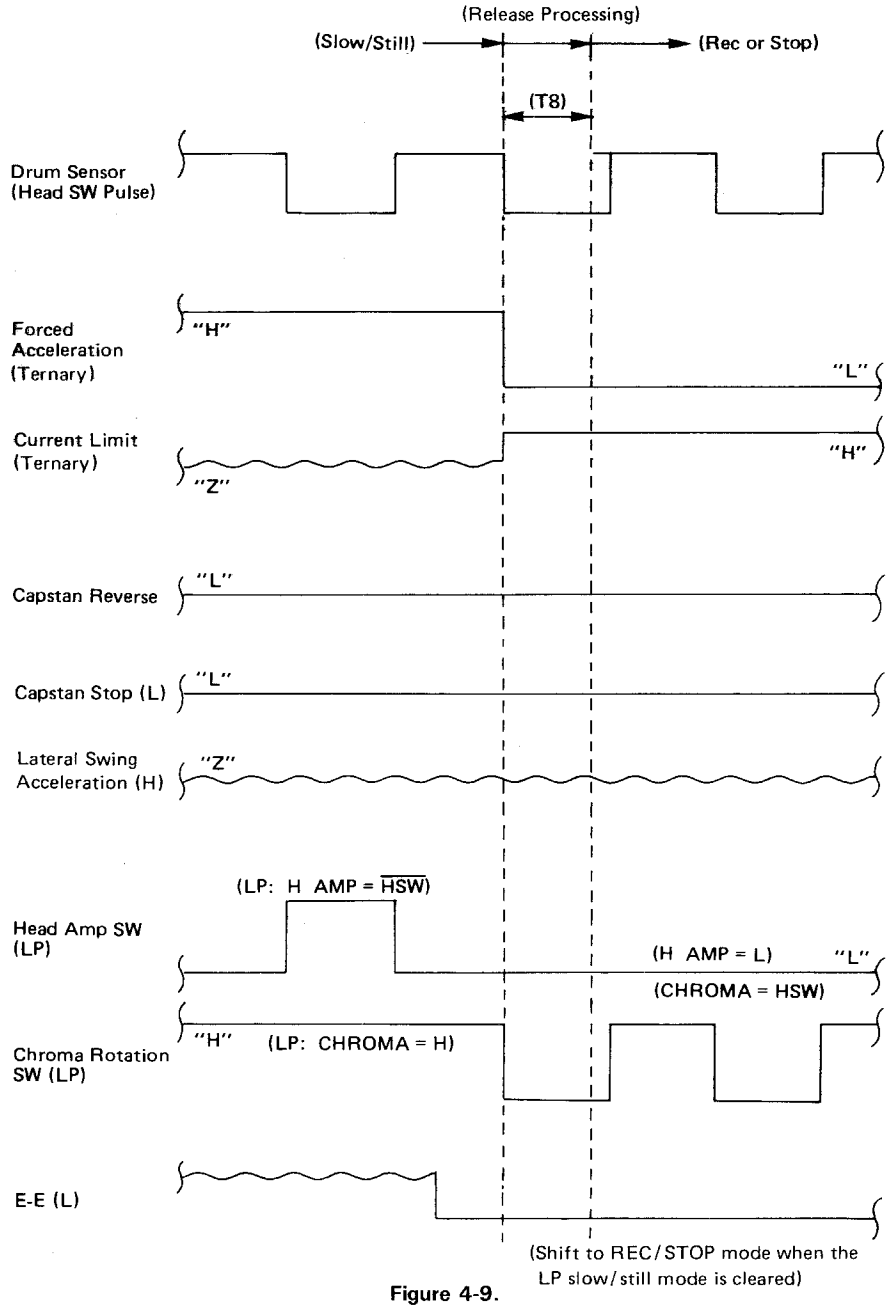


Figure 4-9.

Symbol		Item	Preset Value		
			SP	LP	
Frame Advancing	T0	Start M/M	14.08 ms	9.73 ms	
	T1	Forced acceleration M/M	18.94 ms	11.01 ms	
	T2	Lateral swing acceleration start time	23.04 ms	19.46 ms	
	T3	Lateral swing acceleration M/M	23.81 ms	33.28 ms	
	T4	Speed reduction M/M	11.78 ms	5.12 ms	
	T5	Brake M/M	12.29 ms	3.58 ms	
	T6	Speed reduction M/M (At Still On)	11.78 ms	7.94 ms	
	T7	Brake M/M (At Still On)	12.29 ms	3.58 ms	
Release	T8	Forced acceleration release	23.04 ms	9.22 ms	
	T9	———	—	—	

Note: Head 2 is special for SP; therefore, Slow/Still M/M, etc. of LP is under study.

Table 4-2.

5. TIMER CIRCUIT

5-1. The RH-IX0455GEZZ is a timer microcomputer LSI featuring the channel selection function by a voltage synthesizer tuner.
(VC-A111, A105, A505, T310, T510 Series)

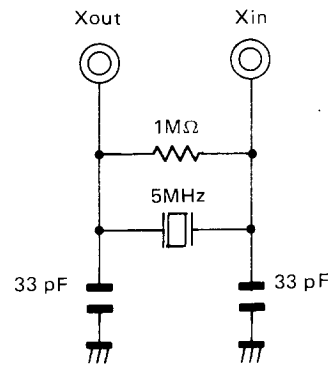
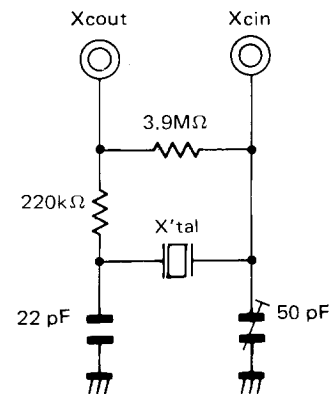
- **Terminal Allocation (RH-iX0455GEZZ)**

Terminal Name	No.	Name		Name	No.	Terminal Name
G11	64	P40		Vcc	1	+5V
G10	63	P41		P65	2	AUDIO-OUTPUT-CTL
G9	62	P42		P64	3	E^2 PROM CS
G8	61	P43		P63	4	E^2 PROM CLK
G7	60	P44		P62	5	E^2 PROM S0/S1/OSD S0
G6	59	P45		P61	6	PWM OUTPUT
G5	58	P46		P60	7	AFT MUTE
G4	57	P47		P27	8	B0
G3	56	P00		P26	9	B1
G2	55	P01		P25	10	OSD MUTE/BLUE BACK
G1	54	P02		P24	11	OSD CLK
S13	53	P03		P23	12	OSD CS-(L)
S12	52	P04		P22	13	CTL FREQ. DIV. IC RESET
S11	51	P05		P21	14	SECAM OSD PROHIBIT INPUT
S10	50	P06	RH-iX0455GEZZ	P20	15	NORMAL (L)
S9	49	P07		Srdy	16	SYSCON-READY-(L)
S4	48	P10		CLK	17	SERIAL-CLK-(L)
S5	47	P11		Sout	18	TIMER-SERIAL-DATA
S3	46	P12		Sin	19	SYSCON-SERIAL-DATA
S7	45	P13		P33	20	CTL-PULSE (1/25)
S6	44	P14		P32	21	INTERNAL CLOCK CLK INPUT
S2	43	P15		P31	22	VIDEO TUNER
S1	42	P16		P30	23	AUDIO TUNER
S8	41	P17		INT1	24	A/C-PULSE
NC	40	P50		INT2	25	R/C-PULSE
PAY (H)	39	P51		CNV_{ss}	26	GND
−30V	38	Vp		RESET	27	RESET -(L)
KEY1	37	P54		Xin	28	CLOCK INPUT
KEY2	36	P55		Xout	29	CLOCK OUTPUT
KEY3	35	P56		XCin	30	CLOCK INPUT FOR TIMER
KEY4	34	P57		XCout	31	CLOCK OUTPUT FOR TIMER
X'TAL ADJ.	33	ϕ		V_{ss}	32	GND

Figure 5-1.

5-2. TERMINAL DESCRIPTION (RH-iX0455GEZZ: Voltage synthesizer tuner)

Pin No.	Name	Description	I/O (Type)
1	Vcc	At 5V to be connected.	
2	AUDIO OUTPUT CTL	Control signal to switch the audio output between (L+R), L, R and NORMAL.	O (C-MOS)
3	E^2PROM CS	Used for serial transfer between Timer and EEPROM. Note that pin No. 5 (EEPROM SI/SO/OSD SV) is commonly used as the OSD Control serial port.	O (C-MOS)
4	E^2PROM CLK		O (C-MOS)
5	OSD SO/E^2PROM SI/SO		I/O (C-MOS)
6	PWM OUTPUT	Tuning voltage PWM output. 14-bit resolution.	O (C-MOS)
7	AFT-MUTE	Output when the volsyn is in preset mode or when tuning is being done.	O (C-MOS)
8	B0	Band switching output for tuning	O (N-CH)
9	B1		O (N-CH)
10	OSD MUTE/ BLUE BACK	OSD control serial terminal.	O (N-CH) O (N-CH)
11	OSD CLK		O (N-CH)
12	OSD CS-(L)		O (N-CH)
13	CTL FREQ. DIV. IC RESET	Control signal to reset the CTL frequency dividing IC.	O (N-CH)
14	SECAM OSD PROHIBIT INPUT	Control signal to prohibit the superimpose function while receiving SECAM signal.	I
15	NORMAL (L)	Terminal commonly used for forced normal (L) output and LR display mute (L) input. (A mute signal is supplied via the N-CH open drain circuit. On Hi-Fi models.)	O (N-CH)
16	SYSCON READY-(L)	Control signal for serial transfer between timer and system controller.	I
17	SYSCON/TIMER CLK		O (N-CH)
18	TIMER SERIAL DATA		O (N-CH)
19	SYSCON SERIAL DATA		I
20	CTL PULSE (1/25)	1-second count source input for the real time counter.	I
21	INTERNAL COUNTER CLK INPUT	Clock count input for the timer. Connected to Pin No. 31. Shortest pattern possible to be taken for connection.	I
22	VIDEO TUNER	Input switching control terminal.	O (N-CH)
23	AUDIO TUNER		O (N-CH)

Pin No.	Name	Description	I/O (Type)
24	A/C INPUT	A/C-shaped signal input for power failure detection. Power failure is identified if there is no change in A/C pulse for 35 msec. External interrupt at the rising edge.	I
25	R/C PULSE INPUT	Rising edge of T/C pulse is detected. External interrupt at the rising edge to measure the interval between two rising edges of R/C pulse.	I
26	CNVss	Connected to GND (0V).	
27	RESET-(L)	All Clear is made when a voltage lower than 0.6V has been put in for 2 μsec or more after the supply voltage reached the microcomputer's operating voltage (5V + 10%).	I
28 29	Xin Xout	System clock generating circuit built-in. System clock is obtained by adding a ceramic resonance circuit as shown below.  **Figure 5-2.**	I O
30 31	Xc in Xc out	Timer count clock generating circuit built-in. Timer count clock is obtained by adding a crystal resonance circuit as shown below.  **Figure 5-3.**	I O
32	Vss	Connected to GND (0V).	

Pin No.	Name	Description	I/O (Type)
33	X'tal ADJ.	Crystal adjustment output. Adjustment is made when the microcomputer is reset. Half the crystal output (32.768 kHz) is given out with jumper provided.	O
34 35 36 37	KEY INPUT 4 KEY INPUT 3 KEY INPUT 2 KEY INPUT 1	4 x 13 matrix is formed by Pin Nos. 41 thru 53 (S1 thru S2). Jumper input or key input is made.	I I
38	Vp	– 30V to be connected	

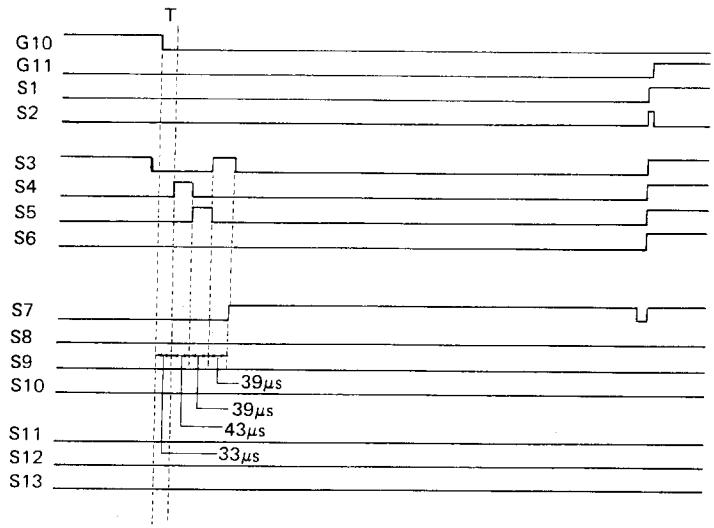


Figure 5-4.

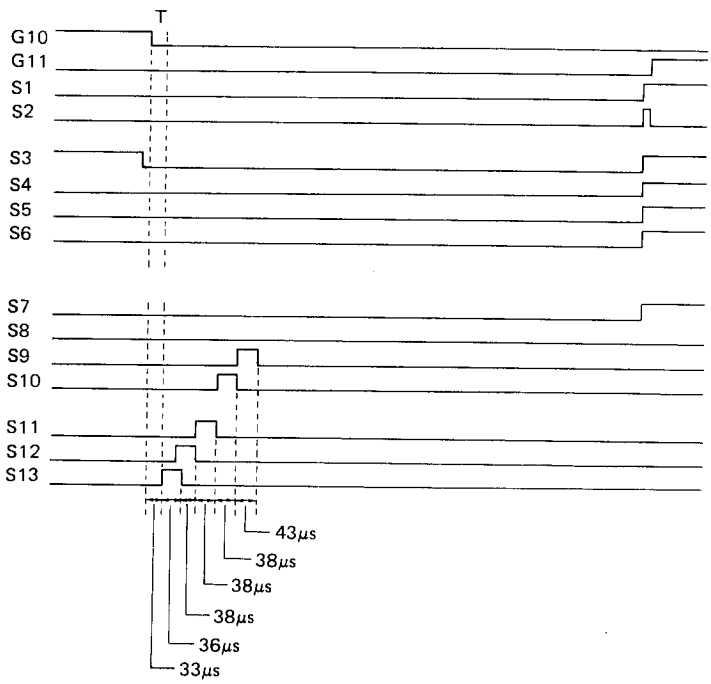
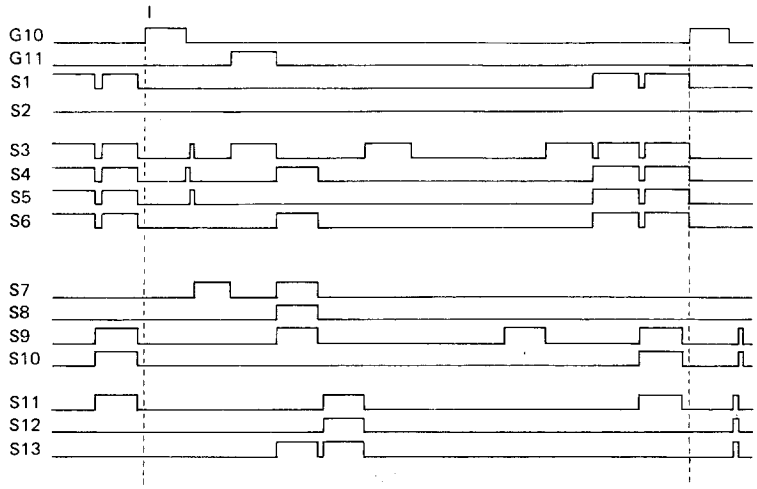
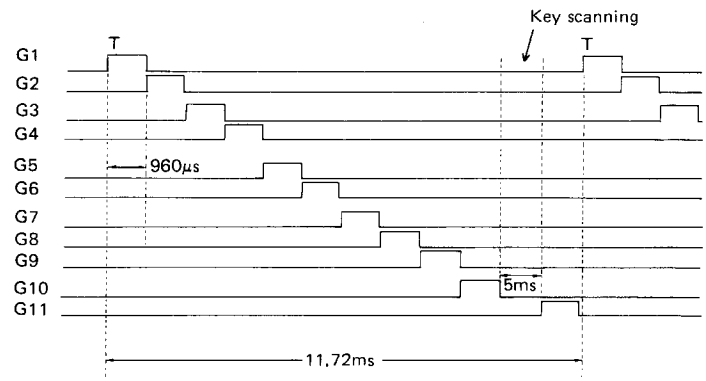
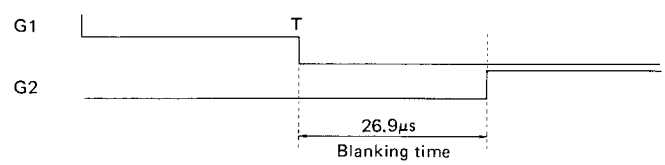


Figure 5-5.

Pin No.	Name	Description	I/O (Type)
39	PAY (H)	Output at "H" while the PAY position is selected.	O (P-CH)
40	NC		
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64	S8 S1 S2 S6 S7 S3 S5 S4 S9 S10 S11 S12 S13 G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11	Output terminals for fluorescent display tube drive segment signal and key scan strobe signal. (Segment signal) Segment signal output is timed with digit signal output at Pins 54 thru 64.  **Figure 5-6.** Output terminals for digit signals to drive the fluorescent display tube.   Display duty $= \frac{960\mu s}{11.72ms} = \frac{1}{12.21}$ **Figure 5-7.**	O (P-CH) High withstand voltage O (P-CH) High withstand voltage

5-3. The RH-IX0454GEZZ is a timer microcomputer LSI featuring the channel selection function by a frequency synthesizer tuner.
(VC-A211, A605, T410 Series and VC-A212GM(BK), VC-A244GM(BK))

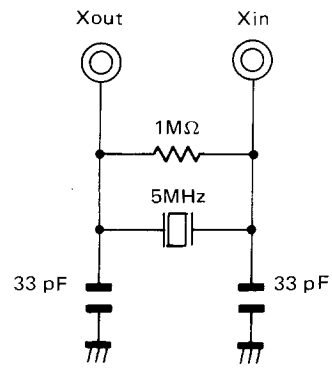
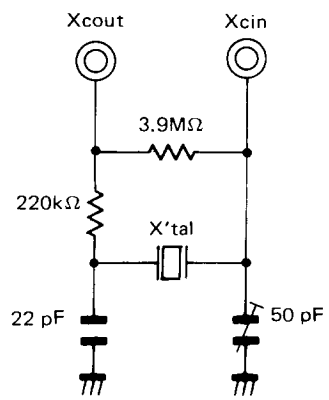
- **Terminal Allocation (RH-iX0454GEZZ)**

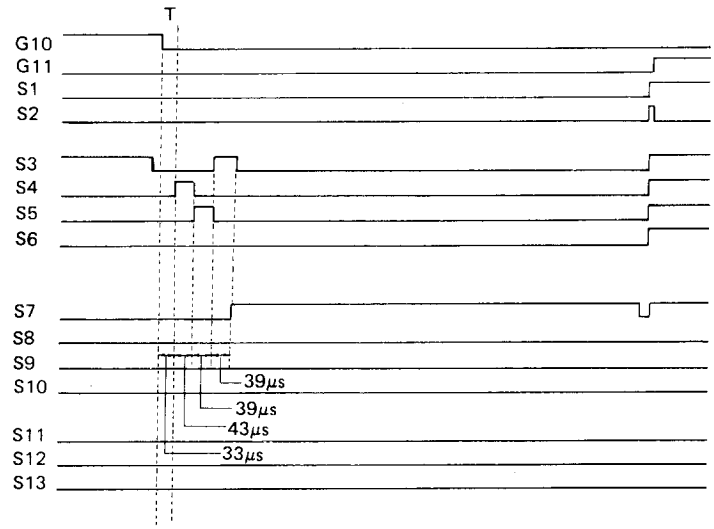
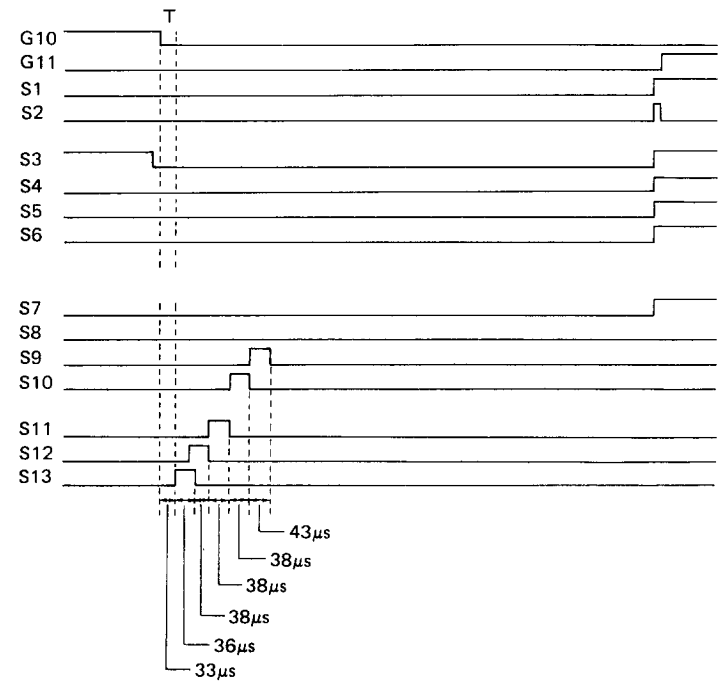
Terminal Name	No.	Name		Name	No.	Terminal Name
G11	64	P40		Vcc	1	+5V
G10	63	P41		P65	2	AUDIO-OUTPUT-CTL
G9	62	P42		P64	3	TUNER-READY-(L)
G8	61	P43		P63	4	TIMER/S_{syn}-CLK
G7	60	P44		P62	5	TIMER-SERIAL-DATA
G6	59	P45		P61	6	TUNER-SERIAL-DATA
G5	58	P46		P60	7	OSD CS-(L)
G4	57	P47		P27	8	OSD CLK
G3	56	P00		P26	9	OSD SO
G2	55	P01		P25	10	OSD MUTE/BLUE BACK
G1	54	P02		P24	11	OSD CLK
S13	53	P03		P23	12	OSD CS-(L)
S12	52	P04		P22	13	CTL FREQ. DIV. IC RESET
S11	51	P05		P21	14	SECAM OSD PROHIBIT INPUT
S10	50	P06	RH-iX0454GEZZ	P20	15	NORMAL (L)
S9	49	P07		Srdy	16	SYSCON-READY-(L)
S4	48	P10		CLK	17	SERIAL-CLK-(L)
S5	47	P11		Sout	18	TIMER-SERIAL-DATA
S3	46	P12		Sin	19	SYSCON-SERIAL-DATA
S7	45	P13		P33	20	CTL-PULSE (1/25)
S6	44	P14		P32	21	INTERNAL CLOCK CLK INPUT
S2	43	P15		P31	22	VIDEO TUNER
S1	42	P16		P30	23	AUDIO TUNER
S8	41	P17		INT1	24	A/C-PULSE
NC	40	P50		INT2	25	R/C-PULSE
TUNER PCON	39	P51		CNV_{ss}	26	GND
−30V	38	Vp		RESET	27	RESET -(L)
KEY1	37	P54		Xin	28	CLOCK INPUT
KEY2	36	P55		Xout	29	CLOCK OUTPUT
KEY3	35	P56		XCin	30	CLOCK INPUT FOR TIMER
KEY4	34	P57		XCout	31	CLOCK OUTPUT FOR TIMER
X'TAL ADJ.	33	ϕ		V_{ss}	32	GND

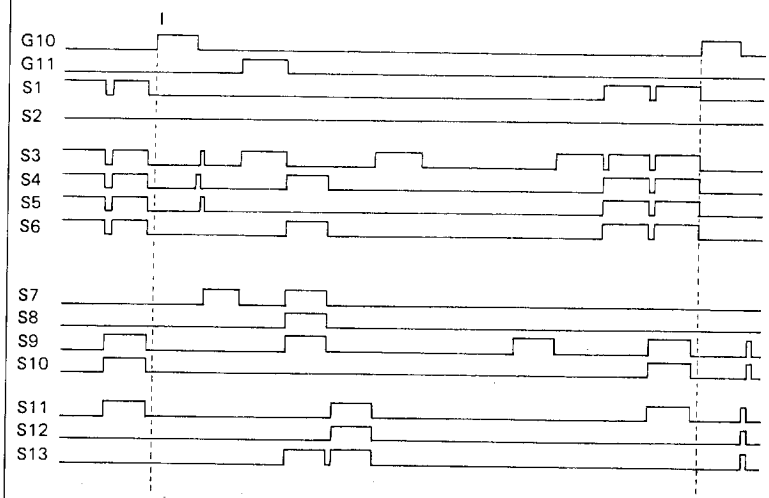
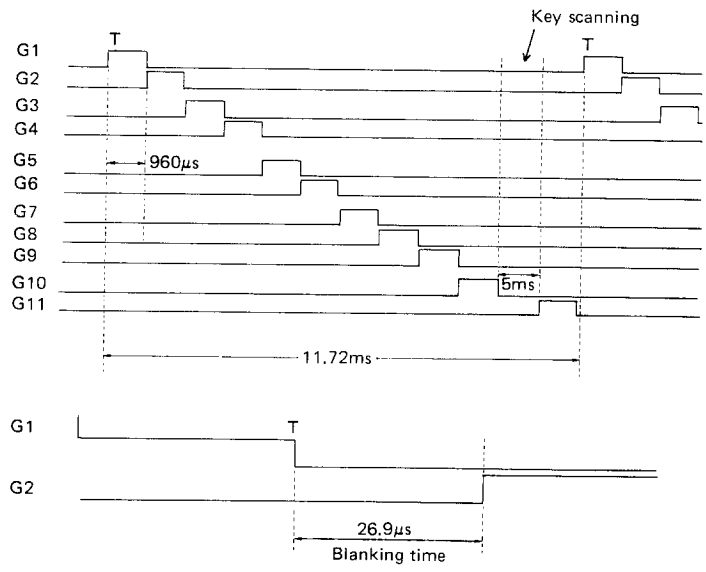
Figure 5-8.

5-4. TERMINAL DESCRIPTION (RH-iX0454GEZZ: Frequency synthesizer tuner)

Pin No.	Name	Description	I/O (Type)
1	Vcc	At 5V to be connected.	
2	AUDIO OUTPUT CTL	Control signal to switch the audio output between (L+R), L, R and NORMAL.	O (C-MOS)
3	TUNER READY-L	Used for serial transfer between Timer and Fsyn.	I
4	TIMER Fsyn CLK		O (C-MOS)
5	TIMER-SERIAL DATA		O (C-MOS)
6	Fsyn-SERIAL-DATA	O (C-MOS)	
7	OSD CS-(L)	OSD control serial terminal.	O (C-MOS)
8	OSD CLK		O (N-CH)
9	OSD SO		O (N-CH)
10	OSD MUTE/ BLUE BACK		O (N-CH)
11	SCL	I^2C BUS control terminal for the VPS decoder.	I/O (N-CH)
12	SDA		I/O (N-CH)
13	CTL FREQ. DIV. IC RESET	Control signal to reset the CTL frequency dividing IC.	O (N-CH)
14	SECAM OSD PROHIBIT INPUT	Control signal to prohibit the superimpose function while receiving SECAM signal.	I
15	NORMAL (L)	Terminal commonly used for forced normal (L) output and LR display mute (L) input. (A mute signal is supplied via the N-CH open drain circuit. On Hi-Fi models.)	O (N-CH)
16	SYSCON READY-(L)	Control signal for serial transfer between timer and system controller.	I
17	SYSCON/TIMER CLK		O (N-CH)
18	TIMER SERIAL DATA		O (N-CH)
19	SYSCON SERIAL DATA		I
20	CTL PULSE (1/25)	1-second count source input for the real time counter.	I
21	INTERNAL COUNTER CLK INPUT	Clock count input for the timer. Connected to Pin No. 31. Shortest pattern possible to be taken for connection.	I
22	VIDEO TUNER	Input switching control terminal.	O (N-CH)
23	AUDIO TUNER		O (N-CH)

Pin No.	Name	Description	I/O (Type)
24	A/C INPUT	A/C-shaped signal input for power failure detection. Power failure is identified if there is no change in A/C pulse for 35 msec. External interrupt at the rising edge.	I
25	R/C PULSE INPUT	Rising edge of T/C pulse is detected. External interrupt at the rising edge to measure the interval between two rising edges of R/C pulse.	I
26	CNVss	Connected to GND (0V).	
27	RESET-(L)	All Clear is made when a voltage lower than 0.6V has been put in for 2 μsec or more after the supply voltage reached the microcomputer's operating voltage (5V + 10%).	I
28 29	Xin Xout	System clock generating circuit built-in. System clock is obtained by adding a ceramic resonance circuit as shown below.  **Figure 5-9.**	I O
30 31	Xc in Xc out	Timer count clock generating circuit built-in. Timer count clock is obtained by adding a crystal resonance circuit as shown below.  **Figure 5-10.**	I O
32	Vss	Connected to GND (0V).	

Pin No.	Name	Description	I/O (Type)
33	X'tal ADJ.	Crystal adjustment output. Adjustment is made when the microcomputer is reset. Half the crystal output (32.768 kHz) is given out with jumper provided.	O
34 35 36 37	KEY INPUT 4 KEY INPUT 3 KEY INPUT 2 KEY INPUT 1	4 x 13 matrix is formed by Pin Nos. 41 thru 53 (S1 thru S2). Jumper input or key input is made.  Figure 5-11.  Figure 5-12.	I I
38	Vp	−30V to be connected	

Pin No.	Name	Description	I/O (Type)
39	TUNER PCON	Control signal to supply the power to the tuner circuit is standby mode.	High with stand voltage
40	NC		
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64	S8 S1 S2 S6 S7 S3 S5 S4 S9 S10 S11 S12 S13 G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11	Output terminals for fluorescent display tube drive segment signal and key scan strobe signal. (Segment signal) Segment signal output is timed with digit signal output at Pins 54 thru 64.  **Figure 5-13.**	O (P-CH) High with-stand voltage
		Output terminals for digit signals to drive the fluorescent display tube.  $\text{Display duty} = \frac{960\mu s}{11.72ms} = \frac{1}{12.21}$ **Figure 5-14.**	O (P-CH) High with-stand voltage

VC-A111,A105,A114,A211,
A244,T212,T310,T410,
VC-A505,A605,T510 Series

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